

JULY 6 1946

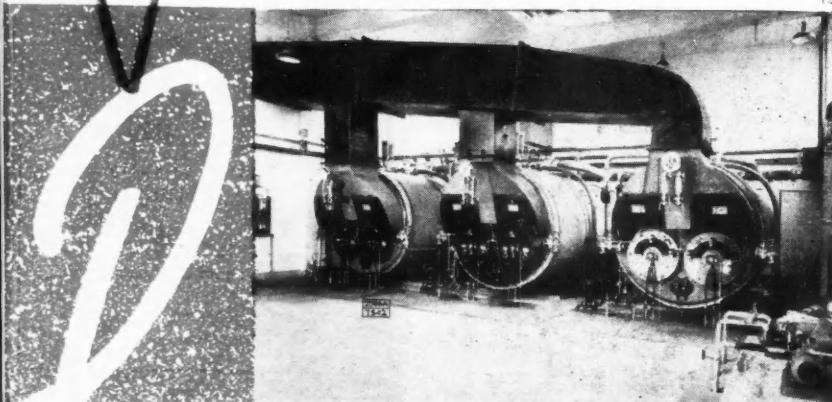
# The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV  
No. 1410

SATURDAY, JULY 6, 1946  
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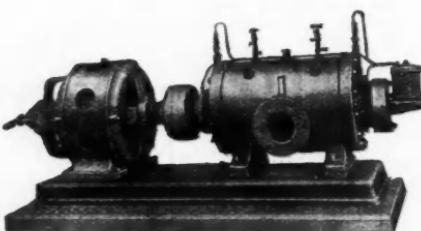
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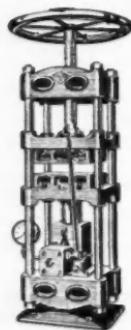
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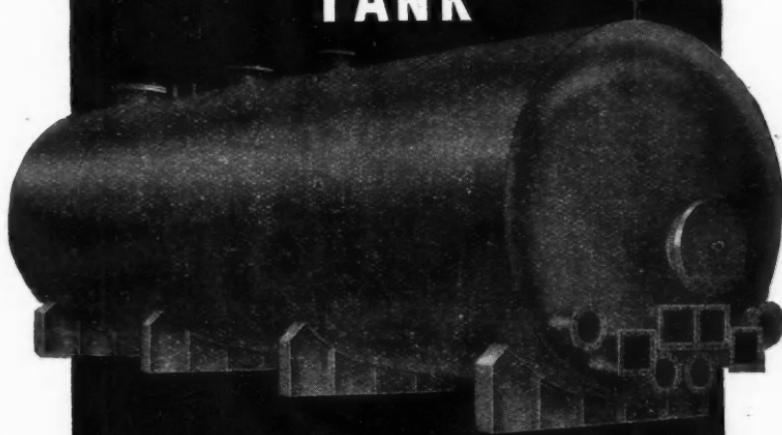
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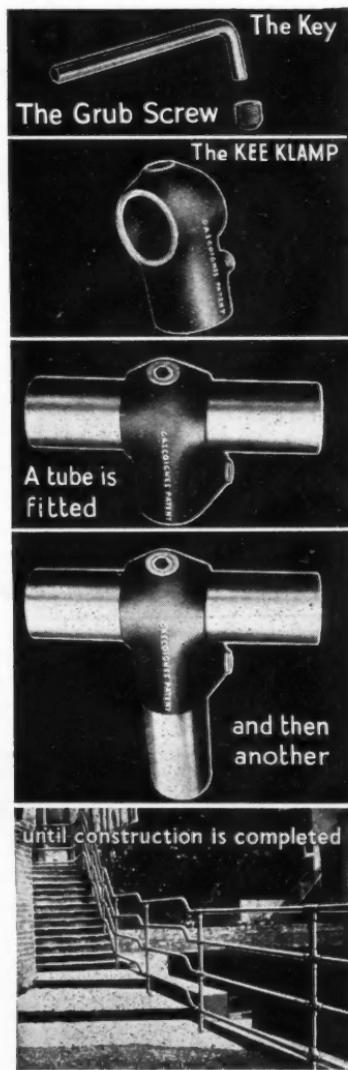
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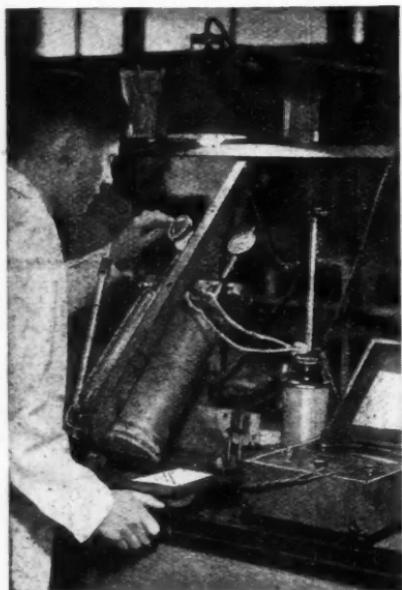
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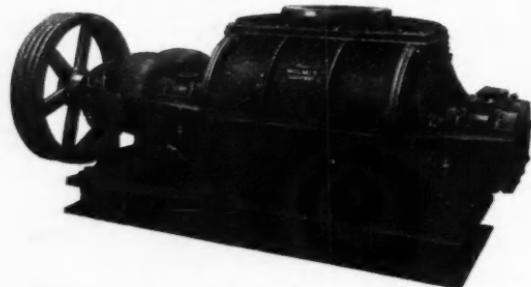
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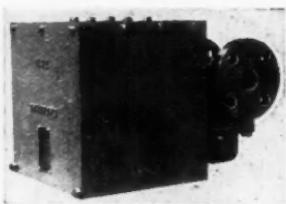
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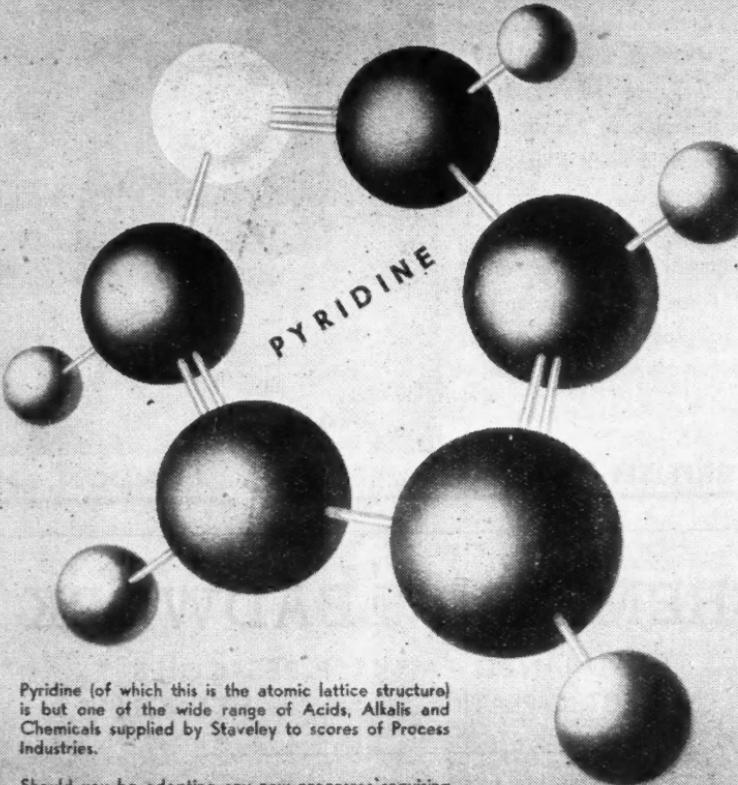


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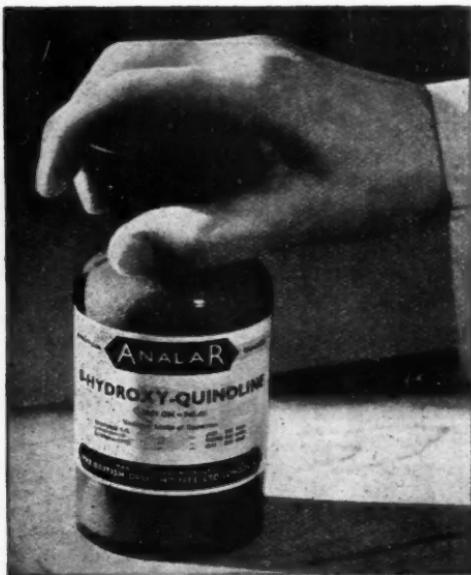
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## Money and Initiative

"**M**ONEY," said G. B. Shaw, "is indeed the most important thing in the world, and all sound and successful personal and national morality should have this fact for its basis. Every teacher or twaddler who denies it, or suppresses it, is an enemy of life. Money controls morality." Into what form of national morality are we now running? It seems that within the lifetime of many of us the monetary situation has changed so radically that, like the Gadarene swine, it is running downhill into some sea in which we shall presently all be immersed to our undoing.

It is elementary to say that this country cannot exist unless it exports. But it is worth saying this in greater detail. In the year 1700, when we had little industry, this country had a population of 5½ million people. It did not support that population in any great comfort, it is true, and no less than a million were in receipt of poor relief. No doubt we could do better to-day with the increase in agricultural skill, with artificial fertilisers and machinery. But we doubt very much whether we could feed and maintain in reasonable comfort as many as 15 millions of people if we did not import from abroad. Before we can import,

we must export. If anything occurs to prevent exports, we perish as a great nation, however rigid an austerity we may practise. All this, of course, is quite elementary, but because it is elementary it may be misunderstood. Not only is it elementary, it is fundamental to our whole political economy.

Why should we fear that anything can stop us from exporting? The answer is twofold. One part of the answer is the increasing industrialisation of all countries, which is already restricting our exports. No longer do these countries want from us our iron and steel, our textiles, or our other basic manufactures, unless we can supply them cheaper and of better quality than they can make them for themselves. In the words of Sir Clive Baillieu, no longer is it sufficient to live up to the

motto "Britain delivers the goods"; we must for the future *create the goods*. What will cause us to create goods? The answer surely lies in incentive. It is not enough to say that the incentive lies in the national need. The incentive to the necessary hard work and to the immense task and financial risk of development work must clearly be a personal incentive. That incentive is gain. Many chemists who have altruistic views, particu-

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larly young scientists who have not yet grown up mentally, will dispute that, maintaining that the urge to do good work is sufficient. For them there lies ahead only disillusionment. They are, in Bernard Shaw's words, enemies to life. As an American, Professor Lutz, has recently written (*Guide-posts to a Free Economy*, McGraw-Hill) that the essence of a successful national economy is this: "If you want to make a dollar by any honest means, you are free to try, and if you succeed, you may keep it." Is our monetary policy with its repressive taxation, its fleecing of the rich and the middle classes, its enormous public expenditure, its terrific national debt, creating the ground on which enterprise will be built up? It is not. The British policy appears to be: "If you want to make a quid by any honest means, you are free to try, and if you succeed, you must give it to the State." Even in Russia a system of high rewards for enterprise and good work has been found to be necessary.

The second part of the answer lies in the cost of production. If our cost of production becomes too high, the foreigner will buy from cheaper-production countries. The experience that the white races had with the Japanese before the war was in line with this. We complained about their cheap production by which, through their low standard of living, they undersold us. No doubt that was very reprehensible, and we shall take steps to see that they do not do it again. But if our costs rise too high other nations will certainly do it, and our last state will be as bad as our first. In the days when this country was really prosperous, income tax was so low as to be negligible and the national debt was trifling by modern standards. We should be the last to suggest that England was a perfect country in those days. There was too much extreme wealth and too much extreme poverty. It is no solution of that difficulty to lop off the top stratum of wealth and add it to the bottom stratum of poverty because the poor outnumber the rich by many millions. What must be done is to raise the standard of living of the lowest stratum. This we have done quite successfully, but for one reason or another income tax now takes away so high a proportion of the income of those who are the brains of the community that the incentive to enterprise has virtually vanished.

In the meantime, the tendency is for

each class of worker in each successive industry to ask for increases in wages to keep pace with the increasing burden of cost. What happens? If the coal miners have their wages doubled, as they have been during the war, the price of coal is doubled. This means that everyone who uses fuels for heating or cooking finds that his fuel bill is increased, his cost of living goes up. Through his Trade Union he applies for an increase in wages, and gets it. Immediately the price of living of the miners goes up and they also require an increase in wages to compensate. So in every industry wages are chasing the cost of living and with each increase in wages the only real effect is to raise the cost of living for everyone else, with only a temporary advantage to those who have received the increase. The basic danger from all this is that costs of production are increased and our goods are being made far more difficult to sell abroad. A time will undoubtedly come when our costs of production are so much raised that it will become impossible for us to sell abroad. As we are in no sense a self-supporting nation it is easy to see that the end can only be disaster.

The same thing is true of the national debt. Two successive wars and many social schemes have raised our national debt to astronomical figures. There are many who argue that this does not matter and it is only an internal affair. Nevertheless, interest has to be paid on this money. The tendency in recent years has been to reduce interest rates and to cause about half the money that is paid out in interest to be returned to the Exchequer in the form of taxation. In effect, therefore, we are now compelling those who have lent money to the Government to give what is almost an interest-free loan. The result is that those who formerly were wont to be thrifty and to put money in Government stocks to gain for themselves sufficient income for their old age now find that they cannot secure sufficient income to make it worth while. Thrift is rapidly disappearing from the land as a result of our monetary policy.

The national debt is to be still further increased. It has been stated by a contemporary that the value that must be paid for the various industries that are to be nationalised is of the order of £2,500,000,000. The theorist will say that since these industries have paid dividends in the past they will continue to do so, and

that the State has really got a very good bargain at the expense of the present shareholders. We quite agree that the present shareholders are likely to receive less for their shares than they could obtain in the open market, but the past history of nationalisation in other countries suggests that there will be no dividends from nationalised industries in a very few years, and that again in effect the State will be paying out this vast sum of money, upon which it must guarantee interest, and upon which there will be no return. The taxpayer will again have to meet the bill. The cost of living will rise. Exports will be more difficult to sell.

These views will do doubt be roundly condemned by the modern as reactionary. They may be so by modern standards. We are not economists. We are just trying to bring a little horse-sense to the situation

to see where we stand, and frankly, what we see we do not like. We seem to be heading for disaster as a nation, and as a result of our financial policy. This policy is not necessarily the fault of the present Government. Much of it has been forced upon us by the two wars of this century. But the present policy of reducing all the nation to a dead level of mediocrity does not seem to help in the least. Why, we ask ourselves, should all be reduced to the lowest level because nine-tenths of the population have not the ability to rise above that level? It may be good socialism, but it is bad economics. Only through enterprise can this nation survive. And as our American friend has put it, the way to enterprise is to leave men free to make an honest dollar and, if they succeed, to keep it.

## NOTES AND COMMENTS

### Scientific Information

**A**LTHOUGH we are ourselves, so to speak, one of the defendants, we are in full sympathy with scientists and industrialists in their complaint that the difficulty of finding out what is being done, all over the world, in their particular field of work, is tending to increase. We are therefore glad to know that the Empire Scientific Conference has given due thought to this problem; it is high time, as both the number of scientific journals and the volume of scientific research are increasing almost daily. The obvious solution, though it is by no means as easy as it sounds, is to improve the available services of abstracting and indexing. The question is how to secure these improvements; and it seems probable that the way recommended at the Conference is as good as any, *viz.*: the appointment of a committee, representing all the interests concerned, including industrial users, to be convened by the Royal Society. Such a committee would explore all possible methods, including the provision of access to the less well-known journals, and it is recognised that to provide an adequate service to this end would call for specific grants-in-aid. No final decision was arrived at on the respective merits of the very brief abstract and the more detailed summary, but it was emphasised that abstractors must keep the needs of the user foremost—a sound point. The

### NOTES AND COMMENTS

provision of scientific information services was also considered—a specially topical subject to-day—likewise the possibility of arrangements for the distribution of reprints, perhaps by an approach to copyright-holders for permission to make wider use of microfilm reproductions. Altogether, this was a distinctly constructive session.

### Post Office Salvage

**S**CRAP lead amounting to 23,000 tons was recovered by the Post Office in 1945; scrap copper from instruments and fittings came to 11,000 tons; and the recovery of bronze and copper wire to 5700 tons. This is not a bad example of thrifty economy on the part of a Government Department, and we wonder, in passing, how the record of other departments compares therewith. The Stores Department of the G.P.O. has a special organisation to deal with "recovered stores," and, in accordance with the best industrial practice, such stores are first examined to see whether parts of them are capable of repair and further use. Unusable material, and waste which is of marketable value, are separated into lots for bulk disposal, the metals, for instance, being made up into sale lots of as many as twenty varieties. Lead from mail-bag seals is melted into ingots, and the dross from the melting has itself a sale value. The Post Office has its own melting plants in London and Birmingham.

In the announcement in which these facts (among others) are contained, the Post Office disarms criticism by quoting the man in the street as likely to comment: "What I should expect, considering the size of the firm." We agree, yet nevertheless it is not unpleasing to know that there is one Government Department which has a trumpet really worth while blowing.

### Fuel and the Future

**T**HE Fuel Efficiency Committee of the Ministry of Fuel and Power, under the chairmanship of Dr. E. S. Grumell, has arranged a conference on "Fuel and the Future," to take place in London on October 9-10. During the intervening months a campaign to promote fuel efficiency and fuel economy is being undertaken by the Ministry through various agencies, and the conference, which will come at the end of this summer campaign, is intended to focus attention on development during the next five to seven years, and on the fuel savings that can be made, both inside and outside industry, with the aid of the new equipment now becoming more readily available. The objective of the campaign is twofold: to promote a higher standard of efficiency in the employment of all forms of fuel in every possible field and to secure the maximum economy in use in the national interest and in the interest of consumers. The Ministers of Fuel and Power and of Health will open the proceedings at the Central Hall, Westminster, on the Tuesday morning, and the conference will then distribute itself among eight sections, six of them representing industries with related fuel problems. Special sessions will be devoted to the sizing and grading of coal and to district heating, and at the closing session the sectional chairmen will outline the proceedings of their sections. Details will be issued in the interim by the Ministry of Fuel, and further particulars can be obtained from their Fuel Efficiency Directorate, or from any regional office of the Ministry. The Institute of Fuel's Melchett Lecture will be delivered on the evening of the first day, and their annual reception, dinner and dance is timed for the second evening (October 9).

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**A trade agreement** has been signed between Austria and Hungary under which Hungary will supply fruits, wines, and hides in exchange for Austrian soda, other chemical products and manufactured articles.

## Metal Prices Increased

### Non-Ferrous Metals

**I**N order to bring the selling prices of copper, lead, and zinc in the U.K. more closely into line with current purchases costs, the Minister of Supply has made the Control of Non-Ferrous Metals (No. 24) Order (S.R. & O. 1946, No. 964), which increases the maximum selling prices.

From July 1 copper prices are raised by £12 per ton to £84 ((copper rods by £12 10s. a ton); lead by £10 per ton to £55; zinc by £10 per ton to £49 5s.; and zinc oxide by £8 10s. per ton to a middle-grade price of £53 5s.

Holders of valid licences to purchase copper, lead, or zinc metal granted on or before June 29, may, on application to the Directorate of Non-Ferrous Metals, at 20 Albert Street, Rugby, cover themselves by purchases, where they have not already done so against such licences, up to and including July 15, at the old maximum prices.

### Iron and Steel

The Minister has also made the Control of Iron and Steel (No. 50) Order (S.R. & O. 1946, No. 963), which came into force on July 1. This Order amends the maximum prices for certain iron and steel products and frees wire mesh from control. The main changes are increases in the price of Staffordshire pig iron, galvanised sheets, galvanised and fine sizes of wire, cold-drawn steel tubes, wire netting, and steel castings. The maximum prices for finish machined forgings are withdrawn. Reductions in price of ferro-vanadium and high-speed steel are confirmed.

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## Non-Ferrous Metals

### Latest Scrap Prices

**T**HE Minister of Supply has issued a list of selling prices of non-ferrous scrap metals. The prices relate to Ministry of Supply depots and are subject to sufficient supplies being available. They apply until the end of October and the list is published without prejudice or commitment. Inquiries regarding the list should be addressed to: Directorate of N.F. Metals (Scrap Disposals Dept.), Berkeley Court, S.E. Wing, Glentworth Street, London, N.W.1.

The following is a summary of the prices per ton of the various classes of scrap listed: Copper—scrap, £75 10s. to £78; turnings, £68. Zinc—scrap, £40. Brass—ingots, £67 10s.; scrap, £59 to £66; turnings, £54 to £55; 70/30 metallics, £50; 60/40 rod swarf, £49; 60/40 broken down fuse scrap, £56 10s.; 90/100 gilding metal scrap, £71 to £73; 95/5 cap metal webbing, £74. Scrap bullet envelopes—cupro-nickel, £82; gilded metal, £61 10s.

# Phosphating Metallic Surfaces

## I. History and Pre-Treatment

by W. G. CASS

THE use of phosphating for the protection of iron is said to date back to the time of the Romans, mainly on the authority of Jakobi, who, in his interesting book on the Roman castle at Saalburg, near Homburg vor der Höhe, dated 1897, described the remains of iron utensils which had every appearance of having been coated with phosphate by some means or other. Dr. W. Overath, in *Korr. u. Metallschutz*, 1934, 10, 58, has some historical notes on the subject, and came to the conclusion that the Roman utensils found at Saalburg had been specially treated to resist corrosion; and Neuberger, in his *Technique of Antiquity* (Leipzig, 1920) also refers to early work in this important field. It is, of course, clear that the ravages of corrosion must have made themselves evident to all workers in metal at an early date, and means to check it must have been earnestly sought.

But from a technical rather than an antiquarian point of view interest in phosphating methods began about the middle of the nineteenth century. One of the principal investigators into the early history of the subject, the Italian writer Macchia, is often quoted in this connection, both from his numerous contributions to *Korr. u. Met.*, e.g., *Geschichte der Phosphatrostschutzes*, loc. cit., 1936, 12, 197, and his book on *Protezione Fosfatifica del Ferro*, etc., Turin, 1938, followed by a German edition in 1940. A brief but informative summary of early history is also given in the standard German work on the protection of metals from corrosion, namely, that of Bauer, Kröhnke and Masing, in three volumes, published by Verlag von S. Hirzel, of Leipzig. The third volume containing the section on phosphating, pp. 345-375, was lithoprinted by the American publishers of German text-books during the war, Edwards, of Ann Arbor, in 1940.

### Early Patents

The earliest patents were those of G. Ross in this country (B.P. 3119/1869), and those of A. P. and N. P. Brown in Germany (G.P. 6998/1879), but they were of little technical or practical significance. According to Lange, in *Chem.-Tech. Vorschriften*, A. de Bussy found in 1849 that iron heated to redness after treatment with coal dust and potassium phosphate could better resist atmospheric corrosion. In his patent of 1869, Ross claimed a method of rust-proofing by immersing red-hot iron

articles in a phosphoric acid solution to form an iron phosphate coating. This appears to be the first mention of a phosphating bath, and was said to be particularly applicable to corset steels. In the Browns' German patent ten years later, the method described was that of immersing heated iron articles in concentrated sodium-ammonium phosphate solutions.

The history of phosphating continues to progress in ten-year stages, for the next date is 1889 or thereabouts, when Erlenmeyer and Heinrich had an article in *Liebig's Annalen* describing some work on manganese, dihydrogen phosphate which was subsequently continued by Viardo in 1899 (*Comptes Rendus*, 1899, 129, 412). This earlier work in France was discussed at some length by V. I. Vulphson in his paper read at the Second Conference on the Corrosion of Metals, Moscow, 1943, though he gives the wrong reference to Erlenmeyer (see Viardo, loc. cit.).

### Decomposition by Water

Viardo, in his paper on "Decomposition of Mono-Manganese Phosphate by Water at 0° and 100°," says that such decomposition of  $MnH_4(PO_4)_2 + 2H_2O$  by either hot or cold water has been known since the work of Erlenmeyer, etc. In cold water there was precipitated a crystalline di-manganese phosphate,  $Mn_2H_2(PO_4)_2 \cdot 6H_2O$ , and in hot water a mixture of di- and tri-manganese phosphate. The reaction was thus already known qualitatively, but the work was incomplete from a quantitative point of view since the earlier authors carried out only three determinations—quite insufficient to evaluate the reaction at 100°. Viardo accordingly carried out two series of several tests at 0° and at 100°. In the low-temperature experiments he found that decomposition was so much the greater in proportion to reduction of the water present; and with a sufficient excess of water the monobasic salt may be dissolved without appreciable decomposition. This occurs, for example, when the ratio of salt to water is 1:100. If R is the ratio of total acid to combined acid, it will show the extent of decomposition effected by the water. P is the number of grams of monobasic phosphate reacting per 100 g. of  $MnO_2$  and  $P_2O_5$ . The weight in mg. respectively of these substances contained in 1 g. of liquid of D density is as shown in Table 1 overleaf.

Thus, up to 20 per cent, P (to water) results are analogous to those in the cold and to the results obtained by Joly with

phosphates of Ba and Ca. That is to say, decomposition increases in proportion as the salt concentration increases—up to 20 per cent. Beyond that point it takes an opposite course and decomposition becomes less and less as salt concentration increases.

P	R	MnO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	D
10	1.06	19.75	41.9	1.06
20	1.14	33.39	76.04	1.11
100	1.19	96.42	232.05	1.39
and at 100°				
0.5	1.24	0.926	2.29	1.005
5	1.75	5.43	19.06	1.025
10	1.85	9.87	36.55	1.04
20	1.88	18.00	67.8	1.08
100	1.65	70.53	282.59	1.32
200	1.55	106.04	330.12	1.50
400	1.52	133.77	405.95	—

Vulphson also quotes Deermont (*Lenin-grad Conference on Metals*, 1933, 18, 90), who gives a general equation for the decomposition of the metal dihydrogen phosphate into a mixture of di- and tri-phosphate, together with free phosphoric acid, and states that concentration of phosphoric acid in the solution remains constant through decomposition of the mono-salt. The di- and tri-compounds formed are partly deposited on the metal and enter into the composition of the coating and are partly thrown down as sludge. According to Liebreich (*Z. Ang. Chem.*, 1930, 43, 35) the free phosphoric acid reacts with the iron surface in stages with successive formation of mono-, di- and tri-ferrous phosphate, and evolution of hydrogen at each stage. Vulphson is of opinion that the phosphating process is rather more complicated, as indicated both by the composition of the solution (iron, manganese and phosphoric acid) and of the coating in which the iron content is about half that of the manganese or much less. He proceeds to formulate an electrochemical theory of phosphating.

These comparatively early speculations on what actually happens in a manganese (or any other) phosphating bath are of considerable interest in the light of the many diverse views since expressed both in the general and in the patent literature; and it is quite possible that they may have some bearing on the patent clashes which appear inevitable in this important field of anti-corrosion work before very long, when questions of infringement and validity come to be tested in the courts. For the number of patents is now excessive, some of them undoubtedly very attenuated in respect of real novelty, and it is difficult to see how they can be maintained. One sample of what appears to be a particularly thin patent in the phosphating field may at least be quoted here. It is a process for

phosphating zinc or galvanised surfaces, and its sole claim to novelty seems to reside in the use of a solution containing a higher iron content than usual, namely, 0.3 per cent. instead of 0.1 per cent.

#### Coslett's Patents

Although it is quite possible that Coslett, of Birmingham, may have derived some ideas from the earlier patent of Ross, it cannot be doubted that he, together with R. G. Richards, of Coventry, were the real founders of the phosphating business on a commercial scale. The first patent, in the name of Thos. W. Coslett, was B.P. 8667/1906. In this is claimed the treatment of iron and steel, to prevent oxidation, with a dilute solution of ordinary phosphoric acid, with or without the addition of iron filings, ferrous phosphate, or other material adapted to control or regulate the chemical reactions, in specified proportions, heated to b.p. It should be pointed out that in all phosphating processes strict control of temperature is important, and as a rule should be maintained just below boiling point. In Coslett's first patent, however, he stipulated boiling point, and therefore it is not correct to say that his temperature was just below b.p., as has been done in some quarters, for the distinction is a most material one. In a later patent, B.P. 28,131/1909, he claimed treatment with phosphoric acid in the presence of zinc, zinc oxide, zinc phosphate, or other zinc compound, together with iron filings. The concentrated solution could be applied direct, or preceded by immersion in dilute solution, accelerated by use of electric current. Reference should also be made to his earlier patent of the same year, B.P. 22,743, in which importance of control of the free acidity of the solution was emphasised. In a still later patent, B.P. 247,071, Coslett included boric acid or borax in his solution, together with the use of the electric current. It will thus be seen that Coslett was a real inventor and introduced some of the basic principles of the phosphating process as used to-day. Progress since has, of course, been considerable in the aggregate, but it has, in the main, taken place by almost infinitesimal stages, and its record is littered up with patents of illusory novelty, if any, and not infrequently of doubtful utility.

Reference to the earlier literature should not omit the patent of Bullock and Calcott, B.P. 16,300/1909, in which an acid iron phosphate solution is used, together with the electric current to accelerate coating formation. The current did not, however, increase the protective value of the coating.

The use of manganese phosphate instead of or together with zinc phosphate was an important forward step, and was due largely to R. G. Richards, of Coventry (B.P. 17,563/1911), who collaborated with M. A. Adams

in work on manganese phosphate solutions.

Brunskill's early patents are also of interest. In B.P. 169,884 is disclosed what is probably the first attempt to apply phosphating to aluminium alloys. It included boiling in an alkaline solution (caustic soda), steaming, treatment with solution containing zinc and iron phosphates, and final washing to remove free phosphates. The solution was prepared by action of *o*-phosphoric acid on granulated zinc, and the paste thus formed is prepared for use by prolonged boiling with scrap iron or steel. In his later patent for iron and steel, B.P. 182,988, Brunskill claimed immersion in solution of zinc dihydrogen phosphate in contact with metallic zinc, so that formation of the green iron phosphate is reduced to a minimum. The time required is said to have been  $\frac{1}{2}$  hr. to 3 hrs., and the larger the percentage of metallic zinc and the lower that of iron phosphate the more rust-resistant is the coating. If Brunskill actually did get any results in half an hour then he had achieved remarkable progress in a very important direction—that of reducing the time required for phosphating. This shortening of time, or accelerating, has been one of the principal aims of many subsequent patents, so that to-day the process is often claimed to be merely a matter of seconds.

### Preparing the Surface

Although phosphating alone increases resistance to rusting, it is usual to treat the phosphated surface with a supplementary coating of oil or grease, or more usually of lacquer, paint, or enamel; and one of the great merits of the phosphate coating is that it very considerably enhances the adhesion and durability of this subsequent finish. Phosphating may thus be regarded as a preliminary bonding or preparation of the metallic surface for further treatment; and in order that it may most effectively play this intermediate rôle the surface, prior to phosphating, must itself be thoroughly cleaned and suitably prepared. According to the care and skill with which this is done, so will be the quality of the phosphate coating both as to its own intrinsic rust-proofing efficiency and its power to enhance the adhesive, protective, and decorative quality of the finish. Thus, very much depends on the preliminary cleaning and other preparatory operations.

Degreasing, pickling, and the general cleaning of metal surfaces is a very large and important technical field in itself, and need not be dealt with in any detail here. In addition, however, to what is generally understood by cleaning, there have been in the later patents some interesting claims for other methods of preparing a metal surface for phosphating, e.g., some form of bonding film which may be electrolytically applied.

For example, iron on which a thin film of electrolytic iron has first been deposited, is said to be more effectively phosphated. In fact, so far from competing with electrolytic methods of surfacing, the phosphating process is now being used in conjunction therewith as a valued collaborator: phosphating being applied to an electrolytic surface, or conversely a phosphated surface being electrolytically finished.

### "Bonding Film"

In B.P. 534,852, the Parker Rust-Proofing Co., of U.S.A., claim a so-called bonding film which is first formed to facilitate application of the main coating, which, in this case, may be done either by chromating or electrolytically, and before action of the bonding solution has proceeded very far or lasted very long—not more than 530 sec. Many variations and examples are given, using a wide range of chemicals; but, generally, the preliminary film may be produced by any known phosphating method, and must be so thin that the main coating solution penetrates and reacts with the metal. This sounds interesting theoretically, but, as in many other phosphating and allied patents there is little information available as to its practical utility. In this case the bonding film appears to be formed by mere drying on the surface rather than by the usual reaction with the metal: in the latter event it is difficult to see how the main coating could be applied by action through the bonding film.

In a further patent covering similar ground, B.P. 547,408, Parker claims a bonding film which may consist of electrolytic iron, zinc, or other metal or alloy, having a maximum thickness of 0.0001 in., followed by chromating with or without phosphate, and possibly preceded by oxidising in acid solution (*phosphoric* or *sulphuric*) with one or more oxidising agents, or by heating, or simply etching; then wetting before chromating. The intermediate treatment is said to provide a thin coating, which is more reactive with hexavalent chromate.

Although these two patents rather refer to chromating as the main coating process, they indicate that phosphating may be combined with other methods in various ways. Probably more relevant examples of a preliminary bonding film for phosphating are provided in the patents of the Westinghouse Electric Co., B.P. 560,847-8. These claim compositions for activating metal and alloy surfaces to facilitate protective coatings (phosphating) by treatment with an aqueous solution of disodium-*o*-phosphate plus small amounts of a titanium compound, the pH being 8.8. It is said that the activating treatment takes only 10-45 sec., and the phosphating 30 sec.; also that metals previously difficult to coat with phosphate now readily take it, e.g., zinc. It seems there-

fore that the bonding film, *inter alia*, is a powerful accelerating agent. Phosphating is followed by the usual rinsing and sealing with chromic acid solution. In subsequent patents, B.P. 564,521-2, the same firm claims other than titanium compounds, such as those of arsenic, bismuth, antimony, molybdenum, lead, or tin, together with an oxidising agent.

The preliminary coating of iron parts with a thin film of electrolytic iron, mentioned above, is claimed in various Parker patents (Can.P. 314,035, G.P. 562,561—in the name of the Parker Dutch Co.—and Fr.P. 683,486). It is said that phosphating can be continued until all the electrolytic iron is converted into insoluble phosphate.

### Preliminary Cleaning

The American Chemical Paint Co. has given special attention to preliminary cleaning and embodies much interesting material thereon in its various patents, e.g., U.S.P. 1,940,913 and B.P. 552,954, 544,640, 550,751. Alkaline and solvent cleaning are described and compared, the importance of subsequent rinsing is emphasised, and the so-called wiping effect is discussed at some length. Careful rinsing, both after acid and alkaline cleaning, is, of course, a primary essential: even with the most careful rinsing after alkaline cleaning, unaccountable variations occur in the steel surface. More recently considerable attention has been paid to the use of emulsion-type cleaners; and the inclusion of some form of colloidal agent has long been known, e.g., silicic acid in the form of sand (Parker, B.P. 350,559).

Attempts to combine cleaning with phosphating in one operation or unit, or to dispense with preliminary cleaning, have been fairly frequent. Thus Parker (through Met. Fin. Research Corp.), in B.P. 390,834, using copper in one form or another; Rust-Proofing Co. of Canada, Ltd., B.P. 464,982, using a fused salt bath which may include phosphates; H. E. Somes, B.P. 470,386, claims cleaning plus coating in a rather elaborate set-up with induction heating, etc.; Rohm & Haas Co., 496,746, combine pickling and coating (phosphating) using complex organics; Am. Chem. Paint Co. 501,739, using baths of zinc oxide and manganese carbonate, with accelerator (nitrite) and spraying; and A.C.P. Co. 571,976, supplementing the usual cleaners—phosphoric acid solutions with one or more solvents, wetting and emulsifying agents, inhibitors, etc.—with added emulsifying agents, as preparatory to painting rather than phosphating.

In further reference to this last-named patent, the use of phosphoric acid for preliminary cleaning was often thought preferable to sulphuric or hydrochloric, but needed a very thorough water rinse afterwards—as, of course, is also the case with other acid or alkaline cleaning—to which a neutralis-

ing agent could be added. A special phosphoric acid cleaner, for example, was introduced at an early date by the Parker European associates (Metallges. A.G. of Frankfurt) under the name of "Antox," with which it is sufficient merely to wipe the metal surface with a leather duster. It contains free phosphoric acid, and zinc and manganese phosphates, with a fat solvent and general cleaning agent. (See G.P. 659,124, 660,436.) See also Grasselli, B.P. 467,839, and U.S.P. 1,949,921; and A.C.P. Co., U.S.P. 1,947,122; and Reynaud, Fr.P. 796,096.

But despite all this work and innumerable patents on chemical cleaning, the older purely mechanical cleaning still holds the field in most cases and is gaining favour. Certainly it eliminates wholly or nearly so any risk of traces of acid or alkali being left on the surface, which may play havoc with the phosphating process. The methods used, shot- or sand-blasting, barrelling with shot, sand, or steel punchings, are well known and widely used, with or without the usual degreasing, etc. In one or two patents it may be of interest to note that the mechanical cleaning is not intended to remove all rust, but only the loose or voluminous variety, the more compact and tightly held being retained as advantageous for subsequent phosphating, e.g., in B.P. 517,916, of C. L. Boyle.

Additional pre-cleaning patents are: A.C.P. Co. U.S.P. 2,164,042, Curtin-Howe Corp. U.S.P. 2,127,207, and Metallurgical Treatment Synd., Ltd., B.P. 438,816 (cathodic pretreatment with copper- or nickel-salt solution), also Dominitsch & Dubrowski, Russ.P. 39,508, and Korr. u. Met., 1936, 12, 223.

(To be continued)

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### LETTER TO THE EDITOR

#### German Technology

SIR.—With reference to recent questions and answers in the House of Commons on B.I.O.S. reports, we think it should be made known that trade associations receive these reports free of charge, whereas non-members have to pay for them. Up to date, we have expended over £30 on this account.

Is not this preference unfair in respect of reports obtained at public expense?

We have found there is a great reluctance to publish details of preferences given by Government departments to trade associations, of which the above is yet another example, and we should be obliged if your space will allow you to print this letter in your next issue.—Yours faithfully,

for Athole G. Allen (Stockton), Ltd.

ATHOLE G. ALLEN,  
Governing Director.

Stockton-on-Tees, June 25.

# Review of Chemical Finance—I

## Trends of Earnings, Dividends and Share Values

by S. HOWARD WITHEY, F.Cmm.A., etc.

DURING the past twelve months, some rapid progress has been made in turning over to peace-time production, and in the chemical industries the problem of reconversion is less acute than for some other industries. The demand for chemical products has been heavy, and the attention of many boards has been directed to expansion of exports.

### I.C.I

The accounts of individual companies submitted during the first half of 1946 show that although in many instances gross earnings have declined, net profit balances have had an upward trend. In the case of IMPERIAL CHEMICAL INDUSTRIES, LTD., for instance, there was a drop of £3,013,981 in the consolidated profit, but the balance of net profit for 1945 registers an improvement of £469,458. The amount attributable to the parent company was returned at £7,409,593, which figure compares with £6,972,988 in 1944 and £6,685,345 in 1943, and the allocation to the company's central obsolescence and depreciation fund was increased from £1,000,000 to £1,500,000. The capital of I.C.I. is £74,479,552, comprising £24,077,691 in the form of 7 per cent. cumulative preference stock—the dividend on which takes £1,685,438 gross—and £50,401,861 in ordinary stock, the dividend on which is maintained at the rate of 8 per cent. gross. This leaves the forward balance £192,006 higher, as indicated below:

	£
Brought forward from 1944	1,145,274
Net earnings (Parent)—1945	7,409,593

Disposable balance	£8,554,867

7 per cent. dividend on £24,077,691	
cumulative preference stock, gross	1,685,438
8 per cent. dividend on £50,401,861	
ordinary stock, gross	4,032,149

Transferred to central obsolescence	
and depreciation reserves	1,500,000
Carried forward to 1946	1,337,280

£8,554,867

The consolidated balance sheet shows fixed assets at £48,585,052, while the current assets amount to £64,937,221. The highest and lowest market prices of the £1 stock units over the past three years are given below:

7 per cent. cum. pref.

£1 stock units:	1943	1944	1945
Highest	36s. 7d.	36s. 3d.	36s. 10d.
Lowest	33s. 4d.	33s. 3d.	34s. 4d.

### Ordinary £1 stock units:

Highest	39s. 10d.	41s.	42s.
Lowest	36s. 9d.	37s.	34s. 4d.

At the recent price of 39s., the preference yield 3.6 per cent., and at 45s. the ordinary £1 stock units give almost the same return.

### Monsanto

The trading profit and other income of MONSANTO CHEMICALS, LTD., amounted to £491,026 in 1945, representing a decline of £127,691 in relation to the corresponding figure for the previous year, but as the provision for taxation was £137,383 lower, the balance of net profit shows an improvement of £4,119. No special allocation is made to the staff fund, which a year earlier received £24,109, and the distribution of an ordinary dividend is resumed at 16.66 per cent., tax free. This company specialises in the manufacture of chemical products mainly for the pharmaceutical trades, and is controlled by the Monsanto Chemical Co., of St. Louis, U.S.A. The capital is £700,000, and consists of £400,000 in the form of 5½ per cent. cumulative preference £1 shares, which are redeemable at the company's option at any time before 1970 at 21s. 6d., and £300,000 in ordinary 10s. shares.

Brought forward from 1944	...	307,733
Net earnings—1945	...	94,997
<hr/>		
Disposable balance		£402,730
<hr/>		
5½ per cent. dividend on £400,000		
redeemable cumulative preference		
shares, less tax	...	11,000
16.66 per cent. dividend on £300,000		
ordinary shares, tax free	...	50,000
Carried forward to 1946	...	341,730
<hr/>		
		£402,730

After deducting depreciation and obsolescence, and adding the cost of capital work in progress, the fixed assets amount to £498,921, and the current assets total £1,490,101. Recently, the preference shares were quoted around 23s.

### Savory and Moore

In the case of SAVORY & MOORE, LTD., manufacturing and retail chemists, there was an expansion of gross earnings and a decline in net profit during the 1944-45 accounting period, and no special transfer was made to reserve. The trading profit was shown at £94,828, as compared with £80,538 pre-

viously, but after providing the sum of £40,552 for taxation, as against only £17,398, the balance of net earnings for the year was £15,280, compared with £20,725, and once again the ordinary capital is without dividend. The company directly controls a number of concerns, including Knoll, Ltd., and Pharmaceutical Products, Ltd., and the capital consists of £386,500 in the form of 5½ per cent. first redeemable cumulative preference stock, £47,997 in 6 per cent. cumulative preference stock, £102,003 in 7½ per cent. cumulative preference stock and £150,000 in ordinary stock. Recently, the 5½ per cent. preference £1 units were quoted at 23s. 6d., at which price the return is 4.7 per cent., and at 23s. the 6 per cents. produce 5.2 per cent. The 7½ per cents. yield over 7 per cent. at the recent price of 21s. 3d. The consolidated statement of the company and its subsidiaries shows fixed assets at £568,815, while the current assets amount to £612,894.

A slightly increased turnover was reported by the directors of SOUTHALLS (BIRMINGHAM) LTD., manufacturers of surgical dressings, bandages and kindred products, etc. In 1945, higher costs and lower profit margins reduced the trading profit to £221,360, but the substantial portfolio of marketable securities brought in a larger income, and a total of £243,875 compares with a trading profit of £310,673 in 1944. Reduced provisions for E.P.T. and income tax resulted in only a slightly reduced net profit balance, and the rate of dividend on the ordinary capital has been raised from 25 per cent. to 27½ per cent. After depreciation and adjustments the fixed assets have a book value of £414,509, and including investments for £705,385 the current assets total £1,393,084. The reserve receives £48,087, leaving the forward balance slightly higher, thus:

	£
Brought forward from 1944	42,396
Net earnings—1945	112,621
Disposable balance	<u>£155,017</u>
27½ per cent. dividend on £468,000 ordinary stock, less tax	64,350
Transferred to general reserve	48,087
Carried forward to 1946	42,580
	<u>£155,017</u>

The capital is wholly in 5s. units, which yield 2½ per cent. at the recent price of 50s. In 1945, the units fluctuated between 40s. and 51s.

#### Spratt's Patent

Shortage of raw materials has restricted the activities of SPRATT'S PATENT, LTD., but higher dividends from subsidiaries brought the trading profit for 1945 up to £96,958, as compared with £76,220 for the

preceding year. The book value of the company's fixed assets was reduced by £15,000, and the balance of net profit was £5,738 higher at £79,458, enabling the ordinary dividend to be raised from 12½ per cent. to 15 per cent. by the distribution of a victory bonus of 2½ per cent. This company of manufacturers of foods for dogs, game, poultry, etc., has a capital of £650,000, made up of £50,000 in the form of 5 per cent. "A" preference shares, £150,000 in 6 per cent. "B" preference shares and £450,000 in ordinary shares of £1, and the forward balance registers a small improvement:

	£
Brought forward from 1944	42,658
Net earnings—1945	79,458
Disposable balance	<u>£122,116</u>
5 per cent. dividend on £50,000 "A" preference shares, gross	2,500
6 per cent. dividend on £150,000 "B" preference shares, gross	9,000
15 per cent. dividend on £450,000 ordinary shares, gross	67,500
Carried forward to 1946	43,116
	<u>£122,116</u>

There is a general reserve of £230,642 and a depreciation fund of £75,000, and including investments the current assets amount to £573,862. The highest and lowest market prices of the ordinary £1 shares over the past three years are as follows:

	1943	1944	1945
Highest	61s. 3d.	63s. 9d.	67s. 6d.
Lowest	48s. 6d.	56s. 9d.	57s. 9d.

At the recent price of 65s., the yield is 3.9 per cent. on the basis of the victory bonus being a non-recurring payment. The "A" preference shares at 24s., and the "B" preference shares at 28s. 6d., give a return of about 4.2 per cent.

#### Milton Antiseptic

An expansion of sales was reported by MILTON ANTISEPTIC, LTD., and its subsidiaries, and both gross and net earnings were higher. The trading profit of £91,193 for 1944-45 includes income from subsidiaries, and compares with £77,323 in the previous year, and although income tax and N.D.C. absorbed £6,170 more, the balance of net profit after debiting depreciation and other charges came out £9,537 higher at £38,960. This company has a capital of £149,998, which comprises £51,922 in the form of 10 per cent. cumulative preference £1 shares—recently quoted around 31s.—and £98,076 in ordinary shares of 10s. denomination which again require a dividend of 15 per cent. After providing £25,707 for development, the forward balance is £3,301 higher:

	£
Brought forward from 1943-44	84,643
Net profit: year ended September 30, 1945	38,960
Disposable balance	<u>£123,603</u>
10 per cent. dividend on £51,922 cumulative preference £1 shares, less tax	2,596
15 per cent. dividend on £98,076 ordinary 10s. shares, less tax	7,856
Provided for development	25,707
Carried forward to 1945-46	<u>87,944</u>
	<u>£123,603</u>

The general reserve is £60,000, and the fixed assets are shown at £166,650, while the current assets amount to £241,508. At the recent price of 42s. 6d. xd., the ordinary 10s. shares yield 3½ per cent.

### Joseph Nathan

Restrictive conditions have again prevented JOSEPH NATHAN & CO., LTD., from satisfying the demand for the company's products, with the result that export business has been handicapped. The gross income received from the subsidiaries during the 1944-45 financial period amounted to £159,680, which compares with £170,530 for the previous year, but rental and other income brought the total up to £171,188, as against £178,767. After charging expenses, fees, interest and taxation, the balance, of net profit was shown at £87,988, representing an increase of £10,425 owing mainly to smaller taxation and enabling the tax-free dividend of 10 per cent. on the ordinary capital to be repeated and the forward balance to be raised. The company has a capital of £779,635, composed of £500,000 in 7 per cent. cumulative preference stock, £200,000 in 8 per cent. cumulative preferred ordinary stock, and £79,635 in ordinary stock:

	£
Brought forward from 1943-44	31,584
Net earnings: year ended September 30, 1945	87,988
Disposable balance	<u>£119,572</u>
7 per cent. dividend on £500,000 cumulative preference stock, gross	35,000
8 per cent. dividend on £200,000 cumulative preferred ordinary stock, gross	16,000
10 per cent. dividend on £79,635 ordinary stock, tax free	7,963
Carried forward to 1945-46	<u>60,609</u>
	<u>£119,572</u>

The interests in Nathan's Sales and the wholesale provision businesses were disposed of, and measures are being taken to concen-

trate resources within Glaxo Laboratories and its subsidiaries. The fixed assets are shown at £800,424, investments at £134,280, and the floating assets at £2,482,714, and at the recent price of 5½ the ordinary 10s. stock units reflect the company's peace-time possibilities and developments.

Although the working profit of the BRITISH COTTON & WOOL DYERS' ASSOCIATION, LTD., was nearly £50,000 higher during the twelve months ended March 31 last, the charge for repairs and renewals was considerably higher than in 1944-45, so that after debiting depreciation, debenture interest and fees, etc., the balance of net profit was £10,736 smaller at £50,355. The rate of dividend has consequently been reduced from 6½ per cent. to 5 per cent. The company has a share capital of £774,165, all of which is in the form of ordinary stock, the 5s. units of which are recently quoted at 8s. 3d., at which price the yield is little more than 3 per cent. There is £620,000 of 4 per cent. first mortgage debenture stock outstanding, and the highest and lowest market prices of this stock and of the ordinary 5s. units over the past three years are given below:

### 4 per cent. First Mortgage

	1943	1944	1945
Highest	93	96½	105
Lowest	87	92	97

	Ordinary 5s. stock units
Highest	7s. 3d.
Lowest	5s. 1d.

Current assets of £960,211 provide a surplus of £905,952 over creditors and provisions.

### Bradford Dyers

After deducting E.P.T., the profit realised by the BRADFORD DYERS' ASSOCIATION, LTD., in 1945, registered an improvement of £9,116 at £634,076, and after charging depreciation, debenture interest and income tax, the net profit figure was £8,514 better at £183,182. This enabled the ordinary dividend of 5 per cent. to be repeated, and another £50,000 to be transferred to the general reserve. The loan capital consists of £1,109,568 in 4 per cent. debenture stock, and the share capital of £4,808,031 is made up of £2,549,237 in the form of 5 per cent. cumulative preference and £2,258,794 in ordinary stock. Highest and lowest prices over the past three years are given below:

	4 per cent. first mortgage
debenture stock	1943 1944 1945
Highest	98
Lowest	92

	5 per cent. cum. pref. stock £1 units:
Highest	19s. 9d. 21s. 4d. 23s. 7d.
Lowest	16s. 10d. 18s. 9d. 20s. 6d.

	Ordinary stock £1 units:
Highest	23s. 10d. 25s. 6d. 28s.
Lowest	14s. 3d. 20s. 22s. 6d.

Recently, the debenture stock was quoted

around 105½, the preference units at 24s. 3d., and the ordinary around 25s. 9d.

### Borax Consolidated

The gross earnings of BORAX CONSOLIDATED, LTD., show little change, the trading and other profits for the 1944-45 financial year being returned at £670,894, which figure compares with £678,997 for the previous twelve months. Heavier charges were incurred, however, and after debiting depreciation and taxation the balance of net profit was £96,238, contrasting sharply with £149,213 in 1943-44. There are two issues of debenture stock outstanding, viz.: £1,000,000 in the form of 4½ per cent. first debenture stock which fluctuated between 106 and 109 during 1945 and was recently quoted at 108 to yield 4.2 per cent., and £1,500,000 in 4½ per cent. debenture stock which at the recent market price of 105 gives a return of more than 4½ per cent. The share capital is £2,700,000, made up of £800,000 in 5½ per cent. cumulative preference stock, £600,000 in 6 per cent. cumulative preferred ordinary stock, and £1,300,000 in deferred ordinary stock, on which a dividend of 7½ per cent. has been maintained.

Brought forward from 1943-44	281,495
Net profit: year ended September 30, 1945	96,238
Disposable balance	£377,733
5½ per cent. dividend on £800,000 cumulative preference stock, less tax	22,000
6 per cent. dividend on £600,000 preferred ordinary stock, less tax	18,000
7½ per cent. dividend on £1,300,000 deferred ordinary stock, less tax	48,750
Carried forward to 1945-46	288,983
	£377,733

Recently, the preference stock was quoted at 13½ per £10 unit, the yield on this basis being 4 per cent., and at 6½ the preferred £5 units produce 4.6 per cent. The deferred £1 units give a return of 3.8 per cent. at the recent price of 45s.

### United Glass Bottle

The finances of UNITED GLASS BOTTLE MANUFACTURERS, LTD., have been strengthened by stability of dividends and by building up reserves, and the rate of dividend on the ordinary capital is now 13½ per cent. After providing for E.P.T., the trading profit for 1945 is shown at £373,875, and investment income brought the total up to £437,398 as compared with £415,963 previously. At £196,756 the balance of net profit registers an improvement of £10,610, and the dividend is covered with a margin which enables another £50,000 to be trans-

ferred to general reserve and £20,721 to be added to the forward balance. This company has a share capital of £2,318,377, comprising £1,201,355 in the form of 7½ per cent. cumulative preference stock and £1,117,022 in ordinary stock:

Brought forward from 1944	55,521
Net earnings: 1945	196,756
Disposable balance	£252,277
7½ per cent. dividend on £1,201,355 cumulative preference stock, less tax	45,051
13½ per cent. dividend on £1,117,022 ordinary stock, less tax	80,984
Transferred to general reserve	50,000
Carried forward to 1946	76,242
	£252,277

In 1945, the preference £1 units fluctuated between 36s. 3d. and 38s. 9d., and were recently quoted at the latter price to return 3.9 per cent. The ordinary £1 units yield 3.6 per cent. at 75s.

(To be continued.)

## Chemical Engineers

### Institution's Award of Bursaries

THE Institution of Chemical Engineers has decided to establish two bursaries, each of £100 per annum, for the purpose of assisting students to obtain a bachelor's degree in chemical engineering.

Candidates must have reached the Higher School Certificate or Intermediate B.Sc. or equivalent standard; they may have spent a period in industry or in H.M. Forces. The bursaries will be tenable for three years, subject to satisfactory progress reports at the end of each academic year. The candidate is not restricted to his place of study, provided that the course is a full-time one and leads to a degree of the standard approved by the Institution. The bursaries can only be granted to such applicants who are able to arrange for admission to a degree course.

Applicants should be British subjects by birth and will be required to produce a copy of their birth certificate before the bursary is granted. In the case of candidates having equal qualifications, preference will be given to those whose applications are supported by corporate members of the Institution. Candidates on the short list may be required to attend for interview. The application should give date and place of birth, names and nationality of parents, and details of the applicant's school career.

Applications should be addressed to the Joint Honorary Secretaries, The Institution of Chemical Engineers, 56 Victoria Street, London, S.W.1, before August 1, 1946.

# Natural Products of the Empire—II

## Possibilities in New Zealand and South Africa

(Continued from THE CHEMICAL AGE, June 29, 1946, p. 729)

**T**HE prime need of New Zealand's economy, Dr. Melville explained, is a diversification of her industry so that a fall in the world price level for the products of her sheep and cattle populations, a condition which in the past has had disastrous effects on her prosperity, can to some extent be buffered by the existence of other industries. In the absence of a heavy industry of any description the outlook for any major diversification is not bright and an important part of Dr. Melville's paper was devoted to a consideration of those industries directly related to New Zealand's primary industry.

Certain chemical industries, e.g., lactose, casein and rennet are well established, but there appear to be opportunities, some of them largely unexplored, for the more efficient utilisation of certain by-products. For example, a relatively large quantity of orotic acid has been produced on a pilot-plant scale, but no market has so far been found for it. On the other hand, a sound gelatin industry is operating, with few technical difficulties. The total value of established and potential industries of this type, however, is small in relation to that of the industry on which they are based.

With the one exception of the utilisation of forest products, the same is true of industries not directly related to primary industry. Fish-liver oils from the *Makaira* "swordfish" and seaweed products—agar from *Pterocladia*, and alginic acid from *Macrocystis*—for example, appear to have real potentialities, but their growth to a position where they can act as an economic stabiliser to New Zealand's primary industry is out of the question.

With timber the position could be materially different. As a result of a combination of favourable factors, tree growth in New Zealand is rapid and her exotic forests are on a large scale, with extensive post-war plantings probable. More efficient utilisation of the products of the timber and pulp-logging industries is an urgent problem facing all timber-producing countries. Its solution would automatically go a long way towards the desired diversification of industry in New Zealand. The production of fibre from New Zealand flax, *Phormium tenax*, continues to have a chequered career, but with proper breeding and selection the industry could become a valuable asset.

### Products of South Africa

In Dr. van Eck's survey of the raw materials available in the Union of South Africa, the point was made that the economic aspect cannot be disregarded; it would thus ap-

pear that the best basis for developing resources is to observe the rule that all productive efforts be directed in accordance with the country's comparative advantages. The application of this rule would also have the most beneficial effect on the development of neighbouring territories.

In discussing mineral resources, particular emphasis was laid on iron, manganese and chromium ores. With the developments that have already taken place in the iron and steel industry, the production of stainless steels on a large scale may become of great importance because of the Union's favourable position; but research is still necessary. There are also possibilities of foundry development in the ferrous and non-ferrous fields. The Union has a great comparative advantage in its large and cheap coal deposits which in future should play an important part as a raw material in the chemical industry. With modern technological advances the coalfields become potential oilfields and the raw material basis for numerous important chemical industries.

Some specially selected exotic trees grow faster in South Africa than in most other countries of the world. This fact, linked with chemical industries based on the sugar industry, emphasises the possibilities of masonite, paper, cellulose, and cellulose derivatives, provided that adequate water supplies can be made available to industry. However, although the Union has some great natural advantages it is deficient in other directions, and it seems probable that greater all-round progress will be made if there is closer collaboration with other African territories in the interchange of materials.

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### CRYSTALLINE PENICILLIN

Commercial production of sodium penicillin in crystalline form has been announced by the Commercial Solvents Corp., New York. Special crystallisation in the final production stage of the penicillin salt has made possible the production of the crystalline product, which has high potency and is heat stable. Refrigeration during storage and shipping is thus eliminated. The potency of the crystalline drug is of the order of 1400 to 1500 units per mg, and it will be available in single vials of 100,000, 200,000 or 500,000 units. It is white in colour and under a microscope the crystals are visible. Because of the increased purity, dosages as high as 200,000 units have been possible, as against dosages of 50,000 to 60,000 units with the former amorphous preparation.

## Scientific Equipment

### Promotion of Exports

**F**IRMS well known in the chemical industry are among the founder companies of a new organisation known as Scientific Exports (Great Britain), Ltd.—otherwise SCIEX—which, as its name implies, has as its objective the provision of export facilities in order to secure the widest possible distribution of scientific equipment.

The founder companies and their principal products are :

Adam Hilger, Ltd. Spectroscopic and other optical instruments.

W. Watson & Sons, Ltd. Microscopes of all types.

Baird & Tatlock (London), Ltd. Scientific instruments and laboratory apparatus of all types.

Hopkin & Williams, Ltd. Fine chemicals and Analar reagents.

Allen & Hanbury, Ltd. Surgical instruments and sutures.

W. Edwards & Co. (London), Ltd. High vacuum equipment.

E. R. Watts & Son, Ltd. Surveying instruments.

### Wide Range of Products

All are firms of considerable standing which have already had extensive export experience, and they have pooled their knowledge in this organisation, thereby being able to offer a wide range of scientific products. During the past few months visits have been made by members of the organisation to India, the Middle East, and Latin America. Only recently, a group of members returned from Scandinavia and several European countries. It is intended that members shall visit other markets, and the possibility of local manufacture in various countries is already under consideration.

Mr. Marquand, Secretary for Overseas Trade, speaking at an inaugural reception recently, said the particular method of export which the new organisation was inaugurating was a very interesting one which should commend itself to other industries and trades. SCIEX represented the efficient association together of a number of firms producing non-identical products which were non-competitive one with another, but which served the same kind of general purpose and which were complementary to one another in the common purpose of selling abroad. The Export Promotion Department of the Board of Trade would be willing to help SCIEX in any way it could, also any other such organisation.

Mr. J. E. C. Bailey, president of the Scientific Instrument Manufacturers' Association of Great Britain, Ltd., congratulated SCIEX on its formation. He said the scientific instruments of this country were second to none, not excluding German

products. It was known, for example, that about 75 per cent. of the lenses used in the great film industry are made in this country. Before the war, the laboratory was a necessary evil. It was the exception rather than the rule. All research expenditure was taxed, but now the laboratory had become important and everybody must have one. There was a big demand for British instruments.

In a pamphlet published by SCIEX, it is described as a co-operative selling organisation designed to develop the export sales of British firms producing a wide range of high quality scientific and surgical equipment. It offers an economic and efficient method of obtaining the widest possible overseas distribution. The expenses of foreign travel and development of fresh markets, which would normally have to be made by each individual company, are met by SCIEX, acting on behalf of its member firms. All information is pooled and the overseas contacts of all its member firms are at the disposal of SCIEX. Although a complete export sales service is offered to member firms, a cardinal feature of the organisation is that member firms retain their own goodwill and identity in overseas markets.

The offices of SCIEX are at Buckingham House, Buckingham Street, Adelphi, London, W.C.2.

### CHROME ORE PRICES

The Minister of Supply announces the following selling prices per ton for chrome ore as from July 1 : (all delivered consumers' works) :

*Refractory Grade*.—Rhodesian, £9 17s. 6d.; Transvaal, £8; Grecian : 1st grade, £10 5s., 2nd grade, £9 7s. 6d.; Sierra Leone, £9 15s.

*Metallurgical Grade*.—Rhodesian washed concentrates, metallurgical, and Baluchistan, £10.

*Chemical Grade*.—Rhodesian Dyke chemical and Baluchistan chemical £10; X.L. concentrates, £10 2s. 6d.

### REFINED OIL PRICES

The Minister of Food announces that the only changes in the present prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period June 23 to August 17 are as follows (all prices are per ton, naked, ex-works) :

**Coconut Oil**.—Refined deodorised increased by £7 to £56; refined hardened deodorised increased by £7 to £60.

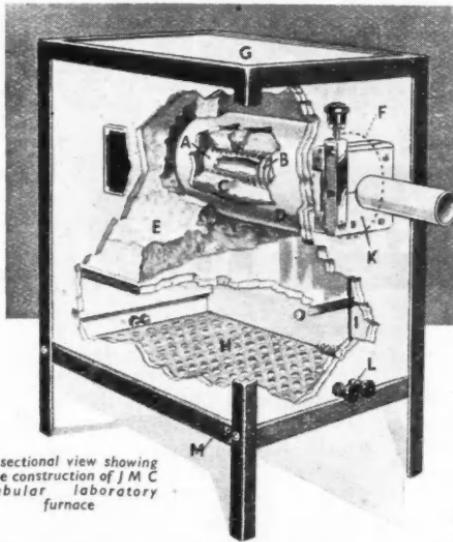
**Palm Kernel Oil**.—Refined deodorised increased by £7 to £56; refined hardened deodorised increased by £7 to £60.

# Metallurgical Section

Published the first Saturday in the month

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## The Ion Exchanger

*further explains . . .*

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- (1) Recovery of valuable materials from dilute solutions.
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# Metallurgical Section

July 6, 1946

## Reclamation of Wet Process Waste

### The Use of Metallurgical By-Product Liquors

by A. G. AREND

**W**HILE most waste liquors and by-products from the majority of metallurgical processes have been turned to account recently in view of the desire to conserve raw materials, some of them are still disposed of without any attempt at reclamation. This does not relate to poor materials such as slags, cinders, or weak acid liquors from which all economically recoverable constituents have been extracted, but to those which, because of the complexity of their composition, have been ignored.

An example of this is seen in the by-product liquors which are discharged to waste in enormous volumes from wet extraction processes, of which copper systems are probably the most noteworthy. One of the unusual features of these is that there is sometimes more zinc present than the original copper content, i.e., before extraction. The work of copper recovery is proceeded with, but the excess zinc is run to waste. This can be partly attributed to the fact that when these methods were originally instituted the market price of zinc was extremely low; and spelter from the distillation hearths sufficed for most purposes such as making cheap brass, galvanising, etc. To-day, pure electrolytic zinc is used for all higher-grade brasses and aluminium alloys, and appears to be in ever-increasing demand. Despite this, the fluctuating percentage of zinc in solutions of widely varying composition and concentration has done much to discourage the adoption of electrolytic processes on a large scale, a particular difficulty being the great surplus of iron salts.

#### Sodium Sulphate Recovery

Recognising these difficulties, research workers turned their attention to recovering sodium sulphate, and simultaneously converting the iron salts to a marketable condition. It should be understood that in the precipitation of copper, galvanised-iron scrap is more effective than ordinary sheet-iron scrap, which increases the zinc content of the solution. Where the original amount of iron has been rendered low by dint of suitable manipulation during roasting and leaching, it was proposed to substitute zinc

for precipitating the copper. The enriched zinc liquors were then to be subjected to electrolysis, but in practice this method was not persevered with; many complications set in, excessive current was consumed, and the conditions had to be altered so frequently that the process was ultimately abandoned. Much more attention was paid to the sodium sulphate and iron salts, and either then, or earlier where permissible, the remaining zinc was recovered. In other words, the zinc was left to pay its own passage through the process, but if the zinc was present in insufficient quantity, this section of the work was omitted.

For each ton of ore originally treated for the extraction of copper, gold, and silver, as much as 150-200 gallons of liquor are produced. No trace of precious metals remains, but a small copper content is purposely left as it is uneconomical to iron this down beyond a certain limit (usually a 5 grains per gallon minimum).

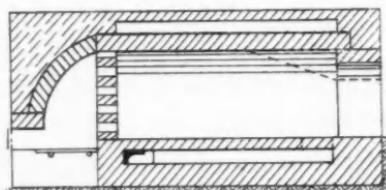
#### Precipitation of Nickel

Most ores yield a liquor containing 4 grains of nickel per gallon, but richer varieties, which contained from 15 to 20 grains per gallon, used to be subjected to the cheap liming process. The resulting nickel mud, however, was not much in demand, as rich nickel ores abounded in great quantity elsewhere. An alternative system was a specialised zincing method which precipitated the nickel as a black, almost metallic mass, and yielded enriched zinc solutions, but the success of this was entirely contingent upon the subsequent economic electrolysis of zinc.

On the other hand, iron is present up to 5 or 6 oz. per gallon, and there is an even greater, although more fluctuating, quantity of sodium sulphate, and it was this disparity which at first attracted attention to recovering these as the main issue.

One of the practical difficulties which have always to be contended with in handling waste solutions is that there is often a large surplus of water, since no regard has been paid to this item. The bulk of the liquor tends to mount up after each filtration, and when precipitating copper, if

there is any evidence of diminishing action, fresh weak acid is added to assist the corrosion of the scrap iron, thus further diluting the material. When the reclamation pro-



**Fig. 1.** Type of early brick-lined chamber in which waste liquors were evaporated to dryness.

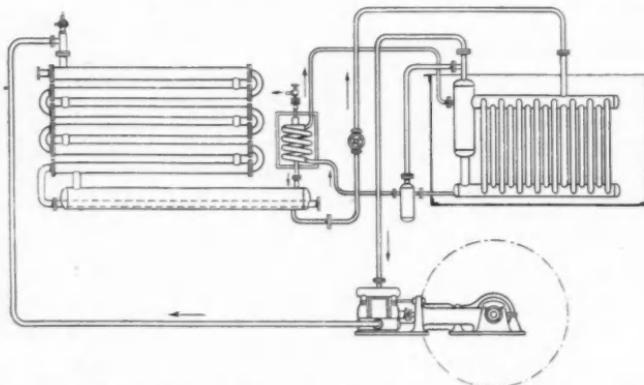
cess is used, efforts are made to bypass all wash liquors by removing them separately. Some indication of the sodium sulphate content will be gathered when it is mentioned that one works produced waste liquors containing as much as from 10 to 12 oz. per gallon, and each tank held approximately 2000 gallons. About 2 oz. per gallon of undecomposed sodium chloride, and an average of 4 oz. of iron (principally ferrous chloride) was also present.

#### Earlier Evaporation Methods

The evaporation of such a vast amount of liquor in order to crystallise out the salts not only involved the consumption of much fuel, but had to contend with a corrosive type of solution, sometimes containing up to 600 grains of free acid per gallon. This

evaporation and final baking, the iron salts were all converted to the ferric state. The red mass so obtained was then digested in a minimum of water to wash out the crude sodium sulphate for final pan evaporation, and the fine ferric oxide was marketed as Venetian red. In one system, the final evaporation of the sodium salts, when worked at a concentration of from 1.37 to 1.40, was found to separate an almost pure sodium sulphate, completely free from iron salts, and containing only 0.25 per cent. of sodium chloride. Reference is made to a number of patented processes wherein lime was added, with or without the injection of air or steam to form oxidised iron pigments of different kinds.

Those who have seen these processes in actual practice will confirm that the almost phenomenal bulk of the precipitates which has to be handled in this way literally prohibits them from being carried out except in a modified manner, a state of affairs which can be partly attributed to the slow rate at which the ferric salts separate out from relatively strong liquors, and partly to the vast surplus of lime, or limestone, required. An attempted improvement on this was the substitution of calcium chloride liquors as the precipitant, but this merely added unduly to the cost. It was soon realised that because of the large surplus of iron tending to interfere with a good separation of the zinc, the presence of corrosive acid, and the liability of sodium sulphate to pollution, not to mention the vast excess of water, the problem of economical recovery was an extensive one.



**Fig. 2.** General pipe-line arrangement of modern refrigerator layout. Note that the latent heat of condensation of water is only 45 B.Th.U./lb. as against a heat evaporation of 1000 B.Th.U. lb. when condensing by heating.

was a variable mixture of sulphuric and hydrochloric acids, the latter usually predominating. Triple-effect evaporators and other chemical engineering plant in the ordinary way were out of the question, and earlier work chiefly related to evaporating in extensive brick-lined chambers. During

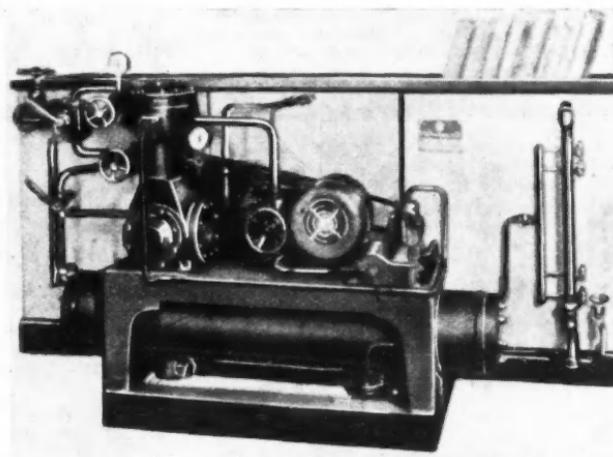
Of recent years, the developments made in refrigeration attracted attention, since intense cold can be applied in a relatively cheap manner when required for only a restricted period. Avoiding the large consumption of fuel required for evaporation, the application of refrigeration tackles the

problem from another angle. This would soon become costly if required for extended periods, but as it so happens, sodium sulphate crystallises out at a temperature of approximately  $-3^{\circ}\text{C}$ . Even if the temperature is reduced to  $-10^{\circ}\text{C}$ , not only sodium chloride, but also the chlorides of iron and zinc remain in solution.

melting is done, to simplify the final crystallisation.

It is claimed that the Glauber salts thus obtained pay for the process by themselves, as the only capital outlay involves the cost of the refrigerator and its attendance, besides wooden crystal tanks. There is no point now in considering evaporation to

Fig. 3. A modern refrigerating machine, giving a good indication of its compact design.



When this process was first suggested, refrigerators were somewhat primitive in type, and the process was not given a fair chance of exploitation. To-day, however, with improved compressors, better pipeline systems, and mechanical handling methods, the crystallisation can be carried out economically and rapidly, so that sodium sulphate is recovered in pure condition, leaving the remaining liquor free from this its main constituent. A further convenience is that each batch of liquor, as it comes from the copper precipitation tanks, can be dealt with in rotation, thereby permitting continuous operation. The liquors are run into the refrigerator system after passing through settlers lined with glazed earthenware which reduce the warmth to almost normal temperatures, thus relieving the strain which otherwise would be put on the system. When the temperature is diminished beyond  $-3^{\circ}\text{C}$ , the crystals of sodium sulphate are seen to separate out rapidly, and are recovered as Glauber salts. As the freezing has caused surplus water to be included in the crystals, the remaining liquor is first run off, when the temperature is then allowed to rise to melt them off. This rich liquor requires only a brief evaporation for crystallisation purposes when this section of the work is completed. Any adhering mother liquor on the crystals is washed off by water spray before the

acquire ferric oxide (as was originally intended) since the solution may contain nearly 90 per cent. of water. Most attention is therefore paid to recovering the zinc content at the expense of the larger quantity of iron.

Instead of using actual zinc for precipitating the copper in the regular process, as much galvanised iron as possible was used, and the liquors on occasion were known to contain upwards of 6 oz. of zinc per gallon. In presence of so much in the way of iron salts, the proposed electrolytic processes were found to be of little practical value. One method of treatment, dependent upon the zinc handled, is to utilise the zinc fume or flue dust made into a paste with water, and to add this to the liquors. This precipitates the iron comparatively easily, provided it has been well oxidised, and simultaneously enriches the zinc content of the solutions, which then can be easily electrolysed, or treated by other known methods.

A less well-known alternative process, hailing from a French source, consists in depositing the zinc, from accurately controlled acid solutions, as the sulphide. This, instead of giving the usual troubles of slow filtration, well known in laboratory practice, filters off relatively easily. The principle involved is that, provided the iron content is not in excess of a fixed figure, zinc alone is precipitated, and it is only when

the last of this zinc has been deposited, that iron starts to come down. The same remarks apply to any nickel which may be in the solution.

Great care is necessary in rearranging the acidity of the solution to a low pH value, moderate temperature, and constant agitation. Crude tank waste liquors suffice as the sodium sulphide reagent, but the addition should be made by gentle increments, when it will be seen that only a white or whitish precipitate forms. Too rapid addition causes the black iron or nickel to appear, and although constant agitation can relieve this, it is less troublesome to run in about  $\frac{1}{2}$  gallon per minute.

This separation can only be done in stages to ensure easy filtration through a filter-press, and a simple analytical test reveals when this has reached the point where the iron is about to come down. The zinc sulphide is dried, after filtering, and either

roasted to make zinc sulphate, or disposed of as it is to paint manufacturers. In an instance such as the one mentioned, where the liquors contained as much as 6 oz. of zinc per gallon, some 750 lb. of zinc can be recovered from each 2000-gallon tank, and it pays to reclaim a third of this quantity. The remaining liquor can then be boiled to remove gas, and limed-down if there is any demand for an iron oxide pigment. In practice it transpired that, despite all the patents taken out to protect the various methods of precipitating limed-down iron oxide pigments, they were not much in demand, as paint makers were able to make these quite economically themselves.

Most attention has accordingly been paid to making certain of recovering the sodium sulphate and zinc, while incidentally leaving the liquors in good condition should any nickel or other metals appear in sufficient quantity to justify reclamation.

## Metallurgical Problems Research Work in the National Physical Laboratory

**A**S mentioned in THE CHEMICAL AGE last week (see p. 721) an opportunity was recently afforded the Press of visiting the National Physical Laboratory at Teddington and of inspecting some of the work that is in progress there.

Considerable interest was evinced in the Metallurgy Division, the primary work in which is research into the physical and mechanical properties of metals and alloys, their constitution and structure. It has many aspects, including the systematic examination of systems of alloys and the effect on their properties of various heating and mechanical treatments. Special attention has been given to the study of the age-hardening of light alloys. The methods of investigation involve the use of the microscope, X-ray analysis, electron diffraction and the electron microscope.

The study and development of aluminium and magnesium alloys have actively engaged the attention of the Division in connection with the use of these alloys in aircraft; and, on behalf of the steel industries, alloys of iron have been prepared in a state of exceptional purity, and their constitution and properties examined. Important investigations of the gaseous impurities of metals, of stress corrosion phenomena, and of the properties of steels and non-ferrous alloys at high temperatures have been made, and many very pure metals have been prepared, including iron, magnesium, beryllium, manganese and chromium.

In the physical section of the Division, the techniques of electron and X-ray diffraction

are being fully utilised in studying metallurgical problems. Work is proceeding on the atomic structure of alloys, in particular iron-nickel-chromium; and an apparatus has been constructed for obtaining X-ray diffraction patterns from block specimens of metals at elevated temperatures up to 1000° C. In order to follow the rate of phase changes, electronic methods of recording the X-ray patterns instantaneously with the aid of Geiger counters are under development. Research is also in active progress on the changes in atomic and crystalline arrangement of metals under stress, and a new combined X-ray and tensile testing machine has been developed for special study of the atomic mechanism of deformation of metals at room temperature and also at elevated temperatures; it has been possible by the apparatus to obtain the stress-strain curve for the atomic lattice of metals and new data on the mechanism of deformation have already been obtained. In general, the work of this section may be summarised as an approach to metallurgical problems from the atomic standpoint.

Some of the unsolved problems in metallurgical science are being referred to electron microscopists in the hope that the high resolving powers available in their instruments, one of which is in use at the National Physical Laboratory, will reveal some significant clues which have remained hidden under the relatively low powers available in optical microscopes. The application of electron microscopes to metallurgy is, however, made rather troublesome by the neces-

sity for transforming the original specimen into a form suitable for examination in this new instrument.

The specimen is first highly polished so that its surface is flat. It is then etched in an appropriate reagent so that the various constituents are attacked differentially and are revealed as geometric features on the surface of the metal: thus a constituent which is relatively little attacked will stand proud of the general surface. A cast of the surface is then made; a typical method is to flood the surface with a solution of a plastic. On drying, the plastic forms a thin film, which is in intimate contact with the metal on one side and which has been pulled flat on the other side by surface tension. The thin film is detached from the surface of the metal and is examined in the electron microscope. A picture is obtained in terms of the varying thickness of the film; thus elevated areas on the specimen lead to relatively thin areas in the film and then to relatively bright areas in the picture. So, finally, constituents in the metal which are little attacked by the etching reagent are revealed as light areas in the pictures and heavily attacked constituents lead to dark areas.

In spite of the indirect method of examination, pictures have been obtained in the electron microscope at magnitudes of 10,000 diameters which are superior in definition to those obtained in optical microscopes at a magnification of 1,000 diameters.

#### High-Temperature Work

Progress in metallurgy involves a gradual increase in the temperatures of many industrial operations, and in this respect the needs of research are even more exacting. The production and utilisation of high temperatures are unfortunately subject to numerous limitations associated with the properties of refractory materials, and for many years it has been necessary for the laboratory to produce refractory ware specially adapted to the demands of research. The preparation and melting of pure metals are particularly dependent on the provision of suitable refractories. Thus, thoria crucibles have been used for determining the melting points of metals of the platinum group, beryllia crucibles are suitable containers for molten beryllium, and alumina crucibles for aluminum.

The pure oxides mentioned above have high melting points, and to make satisfactory ware from them it is necessary to use high-firing temperatures. For this purpose, various types of furnace have been developed in the laboratory, including a very efficient recuperative gas-fired kiln. The air supplied to this furnace by the suction of a chimney some 40 ft. high passes through a nest of refractory tubes heated from the outside by the exhaust gases from the down-draught oven. The oven is evenly heated

by luminous flames, and the use of a chimney for the induction of air gives silent operation combined with reliability. The furnace has a long life at a working temperature of 1750° C. Higher temperatures are easily obtained either by reducing the life of the furnace, or by using superior, and therefore very expensive, refractories. It should, however, be remembered that at temperatures exceeding 1750° C. chemical reactions between different refractory materials occur readily, and difficulties are often encountered in supporting the objects to be fired. For this, and other reasons, it is desirable to reduce the firing temperature. Progress in the technique of producing bodies of pure oxides has already achieved results of this kind, and there is hope of further improvement.

#### Armour-Piercing Shot

During the war a considerable amount of research and development work on armour piercing shot was carried out in the Metallurgy Division. There was, at the beginning of the war, no general appreciation of the physical properties necessary in armour piercing shot, to ensure good performance when fired against armour plate. As a result of work carried out in the laboratory, in collaboration with various Service Departments, a considerable degree of success was achieved in the correlation of the physical properties (in particular the hardness distribution) with the penetrative performance of shot.

Experimental work on the effect of various heat-treatment factors, showed how the required hardness distribution could be obtained, so that the problem of producing shot was finally solved. Heat-treatments for most of the shot in production, from 0.5 in. to 3.7 in. calibre, were developed in the laboratory.

Considerable assistance was given to firms producing shot for the Services and special "calibration" shot used for the calibration of armour plate. The latter must be very uniform in quality and in this connection a non-destructive electrical resistance test has been found very useful.

The preparation of pure metals and a study of their properties are of fundamental importance, and work of this nature has been carried out for many years in the Metallurgy Division. The techniques developed during this work on the preparation of pure metals, and their alloys, of high melting points, are at present being utilised in a study of the ternary alloys of iron, nickel and chromium. These alloys form the basis of many oxidation and corrosion-resistant alloys, but there are ranges of composition and temperature over which excessive brittleness may occur due to the formation of a brittle constituent usually referred to as the sigma phase. A knowledge of the exact location of these ranges is of obvious importance, and their

determination in the pure ternary iron-nickel-chromium is at present being undertaken. The alloys are made by melting together the previously prepared pure metals—iron, nickel and chromium—in *vacuo* or in an atmosphere of hydrogen at reduced pressure. The crucibles used are of thoria-lined pure alumina, specially made in the Refractories Section of the Division. The ingots are then given a homogenising treatment by heating to 1225°C. in *vacuo* in a specially designed platinum-wound furnace, before being subjected to heat-treatments at various temperatures. The resulting structures are being studied by both microscopic and X-ray methods.

### Studies on Hydrogen

It is generally accepted that hydrogen plays a very important part in causing cracks in arc-weld steel joints both in the weld metal deposit itself and also in the adjacent heat affected zone. In the enamelling of welded steel vessels also the presence of hydrogen is very deleterious as it tends to diffuse out during the enamelling process and leads to serious blistering of the glaze. An investigation has therefore been undertaken to determine the amount of hydrogen in weld metal and to ascertain its origin. Standard weld deposits were laid down under rigidly controlled conditions using a series of commercial arc-welding covered electrodes and the hydrogen contents of the various welds determined by the vacuum fusion method developed at the laboratory. At the same time the potential hydrogen present in various forms in the electrode coatings was determined and it was found that for the series of electrodes examined an approximately linear relationship exists between the total hydrogen in the weld deposit and the total potential hydrogen in the particular coating of the electrode with which it was made. It is, therefore, apparent that in order to eliminate hydrogen and its probable deleterious effects from weld metal, it is necessary to keep the potential hydrogen content of the electrode to a minimum.

During the course of the investigation it has been found that a considerable portion of the hydrogen present in weld metal diffuses out in the cold. The amounts were determined by allowing the diffusion to occur in a vacuum and collecting and analysing the evolved gas. The reason why only a portion and not the whole of the hydrogen diffuses in the cold is not yet understood, but it seems probable that the two forms of hydrogen play different parts in the different types of cracking that may occur.

A further point of interest is that the composition of the electrode coating plays an important part in determining not only the total oxygen in the deposit, but also in

controlling the type of oxygen-bearing inclusions as shown by micro-chemical and X-ray analyses of residues separated from the metal by the alcoholic iodine method. The influence which these different types of inclusion may have on the properties of the metal are being investigated.

### Iron and Steel

#### U.K. Output Figures Increasing

FIGURES showing the increase in output of pig-iron and steel ingots in the U.K. have been issued by the Ministry of Supply as follows (all figures represent tons):

		PIG-IRON	Weekly average	Annual rate
May, 1946	...	151,200	...	7,860,000
April, 1946	...	148,700	...	7,732,000
First quarter of 1946		145,500	...	7,566,000
First quarter of 1945		134,500	...	6,992,000
Whole of 1938	...	130,000	...	6,761,100

	STEEL INGOTS AND CASTINGS	Weekly average	Annual rate
May, 1946	...	261,900	...
April, 1946	...	252,100	...
First quarter of 1946		242,600	...
First quarter of 1945		233,200	...

### AGE-HARDENED ALLOYS

Copper-manganese alloys containing 22-24 per cent. manganese, and an equal amount of nickel, respond well to age-hardening treatments and possess physical properties similar to those of the copper-beryllium alloys, according to a paper presented to the American Society of Metals by R. S. Dean, J. R. Long, T. R. Graham, and C. W. Matthews.

Quenching from 650°C. followed by aging at 350°-450°C. for periods up to 24 hours, depending on the hardness and other properties desired, has been found satisfactory. The hardness and physical properties obtained are reproducible within reasonable limits. Like copper-beryllium, these alloys age more rapidly from the cold-worked condition than from the solution treated condition.

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## Parliamentary Topics

### Scientific Man-Power Scheme

**I**N the House of Commons last week, Mr. Erroll asked the Chancellor of the Exchequer whether, in view of the need to conserve scientific man-power, as indicated in the Report of the Committee on Scientific Man-power, he would arrange for an investigation to be made into the present use of scientific man-power in the Civil Service, with a view to ensuring that men and women with high qualifications were not wasted in low grades.

Mr. Dalton replied that efficiency in the use of scientific man-power was one of the main purposes of the new scheme, and he saw no reason for any special consideration.

### Penicillin Production

In the course of a debate in which Mr. E. P. Smith moved the annulment of the Control of Penicillin (No. 1) Order, 1946 (see THE CHEMICAL AGE, June 1, p. 602), Mr. Leonard, Joint Parliamentary Secretary to the Ministry of Supply, gave some current production figures. Referring to the growth of average monthly production in the U.K. from 300 mega units in 1943 to 3200 in 1944, and 6000 in 1945, he announced that penicillin made available in June production this year would be about 300,000 mega units. From this total, some 30,000 mega units would be allocated to the services. There would be export licences, giving nearly 250,000 mega units for home and export use. "Export licences," he continued, "have already been granted for 130,000 mega units, leaving about 120,000 for home consumption, but it must be remembered that production is expected to increase fairly substantially over the next few months, and we are not now importing penicillin."

### Cultivation of Oil Seeds

Mr. Hurd: Will the Minister of Agriculture make arrangements next season so that we can grow and obtain an increasing supply of our own oil seeds, because at present we have only a piecemeal policy?

Mr. Williams: I do not think the hon. gentleman can refer to it as a piecemeal policy, since for the year 1946 the price has been increased from £20 per ton delivered to £30 per ton at the farms. That is a matter of encouragement.

### Linseed Oil Distribution

Dr. Edith Summerskill, replying to questions addressed to the Minister of Food by Mr. Touche and Mr. York, as to whether the Minister's attention had been called to the shipment of 7000 tons of linseed oil from the Argentine to the U.S.S.R., and whether

he was aware that the purchase price was 60 per cent. above Combined Food Board agreed price, stated that Argentine linseed was allocated by the Combined Food Board and the United States had been negotiating with the Argentine authorities on behalf of countries to whom the linseed was allocated. So far as she was aware, the terms of the contract had not yet been settled. Approximately 7000 tons of linseed oil was being shipped from the Argentine in Russian-owned tankers. The Combined Food Board had consented to the transaction on the understanding that the oil was sold to UNRRA as a part of UNRRA's allocation and that it was distributed in territories for which UNRRA was responsible. She understood that the price for the oil had not been finally settled.

### Palm Kernels and Ground-nuts

The Minister of Food, replying to a question by Major J. Morrison, stated that the imports of palm kernels and ground-nuts into the U.K. from West Africa since January 1 last were 121,220 tons and 144,500 tons respectively. He estimated the arrivals between the present time and the end of the year at 177,000 tons of palm kernels and 149,000 tons of ground-nuts.

### Manufacture of Synthetic Oils

Mr. Boyd-Carpenter asked the Minister of Food whether he had made any recommendation to the Home Office with respect to the admission to this country of Dr. Theodor Ruemele, with a view to that gentleman's taking part in the manufacture of synthetic oils for soapmaking.

Dr. Summerskill: Representations to the Home Office have been made by my Department in this matter, and the hon. member will no doubt be hearing from the Home Secretary in the near future.

### Lead Stocks

Mr. Marples asked the Minister of Supply whether he was aware that the stock of refined lead in the U.K. had dropped from 65,300 tons in December, 1945, to 44,600 tons in March, 1946, and what further steps he was taking to improve the position.

Mr. Wilmot replied that in the present acute world shortage of lead it was necessary to run down stocks. A comprehensive rationing scheme was in force and every effort was being made to obtain for this country its full share of the available supplies of lead. In the meantime, the maximum use must be made of substitute materials. Answering further questions, Mr. Wilmot said: "We are buying lead in association with the Americans, who are the other largest buyers, and we are satisfied

that by that co-operation we get the best supplies possible. To go into sheer competitive buying would not improve the position."

### Visit of Russian Scientists

Major Vernon asked the Foreign Secretary whether arrangements were being made for inviting Soviet scientists to visit Britain in return for the visit which British scientists paid to Russia last year.

Mr. McNeil replied in the affirmative, stating that the Soviet Academy of Sciences had accepted the invitation of the Royal Society to send a delegation to the Isaac Newton Tercentenary celebrations in London this month and that cordial invitations had been issued by the Physical Society to a Soviet scientist to deliver the Guthrie Lecture, also to the Soviet Academy of Sciences to nominate a delegation to attend a conference at Cambridge in July.

### Personal Notes

**MONSIEUR FREDERIC JOLIOT** and **MADAME IRENE JOLIOT-CURIE** were among the recipients of the honorary degree of LL.D. at the graduation ceremony of the University of Edinburgh on June 28.

**DR. J. V. N. DORR**, president of the Dorr Company, is visiting Germany to investigate developments in hydro-metallurgy and expects to return *via* London about the middle of the month.

Among the distinguished scientists who received the honorary degree of D.Sc. in the University of Oxford, on the occasion of the visit of the Empire Scientific Conference to that city, were **SIR S. S. BHATNAGAR**, of India, and **SIR DAVID RIVETT**, of Australia, each of whom has played a leading part in the development of chemical science in the British Commonwealth.

**MR. J. MCKILLOP**, whose work as chairman of the North-Western Branch of the Institution of Chemical Engineers has had so much to do with the success of that comparatively youthful section, retired from the service of I.C.I. on June 30. He has been chief engineer, since 1928, and division director, since 1939, of I.C.I., Ltd. (Dye-stuffs Division), Blackley, Manchester.

**MR. H. COURTNEY BRYSON**, managing director of Bryson Processes, Ltd., has been asked to prolong his contract with Fabrica Lusitana de Tintas e Vernizes, Lda., the biggest firm of paint and varnish manufacturers in Portugal, owing to his work in reorganising the factory. He will therefore not be back in England until early August, and he will be returning to Portugal within a few weeks.

**MR. A. B. BLUNSDEN** has been elected chairman of the North Lincolnshire Scientific and Technical Society. This society was formed as a result of the successful joint meeting held in Scunthorpe between the Institution of Chemical Engineers and the Royal Institute of Chemistry last year.

**MR. C. A. BODMER**, of High Speed Alloys, Ltd., Widnes, and the **HON. N. A. COZENS-HARVEY**, of Pilkington Bros., Ltd., St. Helens, have been elected to a committee whose main function will be to advise Ministers and their departments upon industrial conditions within their region and upon steps which may be necessary to bring their resources in capacity or labour into fuller use.

**DR. J. MOFAKHAM**, Director of the Technical College, Teheran, has arrived on a visit to Britain under the auspices of the British Council to see universities and technical colleges. In the London area he is visiting the Imperial College of Science, the National Physical Laboratory, the Northampton Polytechnic, and the Northern Polytechnic, and he will also inspect colleges and plants in Cambridge, Birmingham, Coventry, Manchester, Sheffield, and Halifax, notably the plant of firms making glassware and laboratory equipment.

### Obituary

**DR. THOMAS HOWELL LABY**, Sc.D., F.R.S., Professor of Natural Philosophy at Melbourne University, has died at Melbourne, after a long illness, at the age of 65. Educated at the Universities of Sydney and Cambridge (where he took his Sc.D. degree) he took up the post of demonstrator in chemistry at Sydney in 1901, and later occupied the Chair of Physics at University College, Wellington, New Zealand, in 1909-15. In addition to his work on designing the box respirator in the first World War, and notable research on X-rays and geophysics, he was known to chemists the world over as part author of Kaye and Laby's invaluable *Tables of Physical and Chemical Constants*. He was elected F.R.S. in 1931.

### FERTILISERS DECONTROLLED

The rationing of phosphate fertilisers was abolished from July 1 under a new Order made by the Board of Trade. During July, compounds containing potash can be obtained without permit in England and Wales. No person may, however, acquire a greater quantity of potash than his 1945-1946 permit authorised. The Order, known as the Control of Fertilisers (No. 32) Order, 1946 (S. R. & O. 1946, No. 966) amends the Control of Fertilisers (No. 24) Order, 1942.

## German Technical Reports

### Particulars of Latest Publications

SOME of the latest technical reports from the Intelligence Committee in Germany are detailed below. Copies are obtainable from H.M. Stationery Office at the prices stated.

**CIOS XXXI—20.** *Refining of cobalt, nickel, zinc, and cadmium* (2s. 6d.)

**CIOS XXXIII—29.** *Ruhrgas A.G., Essen : Sulphur recovery from spent purifier oxide* (1s.).

**BIOS 8.** *Manufacture and application of specialised magnetic materials generally, including notes on other alloys requiring similar manufacturing technique* (8s. 6d.).

**BIOS 220.** *Joh. A. Benckiser, Ladenburg, near Heidelberg : Production of citric acid* (1s.).

**BIOS 258.** *I.G. Farben, Griesheim : Carbon electrodes* (1s.).

**BIOS 353.** *Preparation of 5-diethylaminopentanol-2 by the Reppe process* (6d.).

**BIOS 356.** *Characterisation of butadiene catalysts by X-ray and chemical analysis* (1s.).

**BIOS 451.** *Titangesellschaft, Lererusen : Titanium pigments* (2s.).

**BIOS 458.** *The ceramic industry of Germany* (4s. 6d.).

**BIOS 473.** *The manufacture of heavy clay products in Germany* (6s. 6d.).

**BIOS 489.** *Chemische Fabrik Joh. A. Benckiser G.m.b.H., Ladenburg Works : Manufacture of calcium citrate* (2s.).

**FIAT 448.** *Production of vanillin from sulphite waste liquor* (1s. 6d.).

**FIAT 450.** *Wood and cellulose research* (4s. 6d.).

**FIAT 485.** *Ferro-alloy manufacture and use* (1s. 6d.).

**FIAT 486.** *Cellulose ethers, esters and mixed esters at Biebrich (Wiesbaden), Elberfeld and Dormagen* (2s.).

**FIAT 490.** *Use of other materials than wood or cotton as sources of cellulose* (2s. 6d.).

**FIAT 497.** *Welding* (14s.).

## Digest of Statistics

### Chemical and Allied Figures

**R**EDUCED production and consumption of chemicals in the U.K. is recorded in the recently published June issue of the monthly *Digest of Statistics* (H.M.S.O., 2s. 6d. net). In most cases, the latest figures available are for April and those given below are in thousand tons.

Sulphuric acid production, which rose from 141.4 in February to 165.1 in March, fell to 160.3 in April, and production of

superphosphate, which rose from 72.2 in February to 88.1 in March, fell to 84.5. On the other hand, compound fertiliser production again showed an increase : it rose from 112.3 in February to 138.3 in March, and to 146.0 in April.

Consumption of pyrites, which rose from 16.5 in February to 19.1 in March, fell in April to 18.0. Consumption of sulphur for the manufacture of sulphuric acid showed an increase—17.0 in April as against 16.8 in March. Spent oxide consumption went down slightly : in March it was 16.6 and in April 16.4. Sulphuric acid consumption, which in March was 169, dropped in April to 158. The consumption of phosphate rock for fertilisers showed a falling-off—62.3 in April as compared with 68.6 in March. Superphosphate consumption also went down : in March it was 128.1 and in April 116.8. As in March, there was a marked increase in the consumption of compound fertilisers, the April figure being 231.1 as compared with 217.0 the previous month.

Stocks of pyrites, which rose from 70 in February to 84 in March, fell slightly, to 82 in April, but stocks of sulphur for the manufacture of sulphuric acid jumped from 39.3 in March to 59.0 in April. Stocks of spent oxide also rose, from the March figure of 132.7 to 134.6 in April. The decline in stocks of ammonia (excluding ammonia produced in by-product factories and converted directly into ammonium sulphate), noted last month, was again in evidence ; in March the figure was 4.49 and in April 3.24.

Iron ore production, which dropped from 256 in March to 244 in April, went up to 245 in May, and the production of pig-iron likewise increased—from 149 in April to 151 in May. Virgin aluminium production showed an increase, the April figure being 3.29, as compared with 2.59 in March.

The estimated number of people employed in the chemical, explosives, coke-oven and by-product works (figures in thousands) was again lower : in April it was 225.3 (of whom 89.7 were females), as compared with the March figure of 228.3 and the February figure of 233.4.

A process has been developed by which explosives can be converted into fertiliser, according to Brig.-Gen. W. Draper, Chief of Economic Affairs of the American occupation authorities in Germany. As a result, the disposal of captured German stocks of munitions of all kind in the North Sea will be stopped. He explained further that the British authorities had carried out similar experiments in Belgium, and it has been found possible to produce Paranitrate and other similar compounds from explosives. An additional advantage of the new methods is that thousands of tons of steel can be salvaged.

## General News

The Chemical Research Exhibition organised in London by I.C.I. was visited by 14,736 people, and the Cancer Research Fund will, as a result, receive the sum of £741 8s.

**Manchester College of Technology** has received a gift of £60,000 from Courtaulds, Ltd., to re-equip it completely with up-to-date apparatus and machinery for teaching and research in rayon technology.

**The Chemical Society's library** will be closed for stocktaking from August 5 until August 17, inclusive, and will close at 5 p.m. each evening from July 16 to September 30.

**The Minister of Food** announces that there will be no change in the existing prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the five weeks ending August 3.

**Employees of Newton Chambers & Co., Ltd.**, Thorncliffe, Sheffield, appeared on Tuesday night in an opening performance, at Sheffield City Hall, of a pageant of the firm's history, in celebration of the 150th anniversary of the founding of the firm by George Newton and Thomas Chambers.

**The Ministry of Fuel and Power** announces that the address of the Organising Committee of the National Coal Board is now Lansdowne House, Berkeley Square, London, W.1, tel. GROsvenor 4070. This will for a time be the address of the National Coal Board when it is constituted.

**Increases in the maximum prices** for acetates which have been in force since January, 1941, are made by the Control of Molasses and Industrial Alcohol (No. 20) Order, 1946 (S.R. & O. 1946, No. 955). The Order, which came into force on July 1, amends the Control of Molasses and Industrial Alcohol (No. 19) Order, 1945.

**The official cost-of-living index figure** at June 1 was 103 points above the level of July, 1914, as compared with 104 points a month earlier. The fall in the figure was due to reductions in the prices of various articles of domestic ironmongery and pottery following the recent remission of purchase tax on such goods.

**An aerial survey** of banks of seaweed off the Orkney islands has been carried out by Capt. E. E. Fresson, of Scottish Airways, Ltd., with Dr. Woodward, technical adviser to the Scottish Seaweed Research Association. Good banks of seaweed were observed off North Ronaldsay, Sanday, Stronsay, Westray and Rousay. The Association is paying the islanders £3 a ton of dried tangles, plus 5s. a ton for bundling.

## From Week to Week

Virgin copper consumption in the U.K. increased during May to 30,030 tons, as compared with 24,040 tons in April, according to the British Non-Ferrous Metals Federation. Consumption of copper and alloy scrap (copper content) was also higher at 13,590 tons, against 11,410 tons.

**The Treasury** has made an Order, which became effective on June 29, exempting from Key Industry Duty until August 19, guanidin carbonate, guanidin nitrate, guanidin sulphate, and guanidin sulphocyanide. Copies of the Order, which is entitled "The Safeguarding of Industries (Exemption) (No. 3) Order, 1946" (S.R. & O. 1946, No. 884), may be obtained from H.M. Stationery Office, price 1d.

**Construction of the new science building** for the Newcastle division of the University of Durham is to begin immediately, according to a statement by Lord Eustace Percy. The building was planned before the war, and although the money from private benefactions and public subscription is still in hand, the cost will greatly exceed the original estimate, and application will no doubt be made to the University Grants Committee for a capital grant-in-aid.

**The Sir John Cass Technical Institute**, one of the few centres of higher education in the "square mile" of the City of London, has just issued its prospectus for 1946-47. The Institute had a narrow escape from destruction by enemy action in 1940, and the damage then sustained still necessitates a curtailment of the courses. Nevertheless, the courses in the Departments of Chemistry and of Metallurgy are full and varied, and the successes gained in the Faculty of Science of the University of London, and in the Royal Institute of Chemistry, attest the excellence of the instruction.

**Unless buyers** take delivery of a substantial quantity of sulphate of ammonia during the July-December period it will be impossible to deliver their full requirements in time for spring application, says the Ministry of Agriculture. The Government is, therefore, repeating its offer of a distribution allowance of 15s. per ton in respect of a strictly limited tonnage of sulphate of ammonia ordered immediately for agricultural use. Orders for lots exceeding two cwt. received by post by producers between July 1 and the date of the withdrawal of the offer are eligible for the allowance.

### Foreign News

**Czechoslovak glass exports** have revived considerably in recent months and there is hope that the 1937 level will be reached this year.

An asphalt emulsion plant has recently been put into operation near Seoul, Korea.

The two fertiliser plants in the U.S. zone of occupation in Korea, located at Inchon and Samchok, are not in operation because of the shortage of ammonia.

Newfoundland exported last year the following tonnages of metal concentrates to the United States: lead concentrates 44,134 tons, copper concentrates 24,753 tons, and zinc concentrates 40,252 tons.

The Lonza Elektrizitätswerke und Chemische Fabriken A.G., Basle, reports a net profit, for the year ending March 31, of Swiss francs 3,286,875 (3,542,582). An unchanged gross dividend of 6 per cent. has been declared.

Spain's lead output amounted to 26,000 tons in 1945, compared with 34,000 tons in 1944, and a pre-war output of 300,000 tons. The shortage of power forced a number of mines to be closed down during the war years.

Chinese tung oil will be available in considerable quantities in Shanghai ready for shipment abroad as soon as transport facilities are restored in certain parts of the interior, according to an official of the China Vegetable Oil Factory, which is operating a number of tung-oil refineries.

Austria's two largest steel plants are to go back into production—Alpine Montan in the British zone, and the Hermann Göring works near Linz, in the U.S. zone—it was announced by Reuter last week. Full agreement on production programme now awaits only the approval of the Allied Commission.

In Belgium, the distillation of crude oil and its derivatives, with the exception of paraffin, pharmaceutical petroleum jelly, and pharmaceutical white oil, has been freed from Government control. Petrol rationing for motor vehicles has been abolished as from July 1.

A Dutch-Belgian trade agreement, valid for twelve months as from June 1, provides that Holland will deliver electrical and wireless apparatus, bulbs, seeds, potatoes and livestock in return for Belgian textiles, glass, wooden goods, iron, steel, chemical products and fertilisers.

France's iron-ore production amounted to 1,280,400 tons in April, compared with 1,295,700 tons in March, and a monthly average, in 1938, of 2,755,200. Exports showed a gradual increase, with 445,100 tons being exported, mainly to Belgium and Luxembourg, against 428,200 tons in March and a monthly average of 1,158,300 tons in 1938. Bauxite production totalled 34,500 tons in April, a decline by 1500 tons compared with March, while the 1938 monthly average amounted to 56,850 tons. Bauxite exports amounted to a mere 2000 tons.

Italy's steel output averages now about 53,000 tons per month, of which 27,000 tons are Martin and 26,000 tons electro-steel. This figure represents about 25 per cent. of the present production capacity, the fuel shortage being responsible for the low output.

A proposal that Japan's maximum annual steel production should be limited to 3,500,000 metric tons of steel ingot and 2,000,000 metric tons of pig-iron, is contained in a policy statement issued unanimously by the Far Eastern Commission in Washington.

Aluminium works in Germany, owned by the Swiss Aluminium Industrie A.G., will probably be closed down in accordance with the industrial scheme of the Allied occupation authorities. The plants in question are the rolling mills situated in Singen am Hohentwiel, and the smelter in Rheinfelden, South Baden.

Optimism for the future prospects of the Chilean nitrate industry continues; two nitrate plants at Taltal are to resume production. France is reported to be interested in acquiring nitrate and a trade agreement is being discussed with that country, while shipments to Valencia are expected to begin soon.

Oil seeds and their by-products have been put under Government control in Argentina. Stocks of linseed, sunflower seed, ground nuts, turnip seed, and cotton seed must be sold to the Agricultural Production Regulating Board and the quantity to be exported, as well as home and export prices, will be fixed officially. The official estimate of the 1945-46 sunflower seed crop gave a total of 1,101,600 metric tons, compared with the first estimate of 979,000 tons.

Negotiations have been opened between a North African financial group and the Government of the Regency of Tunisia for the resumption of bromine production from the lake of Sebka-el-Malah, near the Tripoli frontier. During the first world war, most of the bromine used by the Allies in the production of poison gas came from this lake, while a plant at Ain-es-Serab also produced potassium salts from it. After the war production was suspended.

In Turkey, all privately-owned chromite mines were closed down last year when Allied purchases came to an end. The Government-owned Guleman mines produced about 70,000 tons of chromite in 1945. Total stocks in the country were reported by the U.S. Embassy at Ankara at about 300,000 tons, much of which, however, is concentrating ore, and the Turkish Government was said to be negotiating in the United States for a concentrator to be installed at the Guleman mine.

## Forthcoming Events

**July 8.** British Association for the Advancement of Science (in collaboration with the Royal Society). Lecture Hall, Royal Institution, Albemarle Street, London, W.1, 2.30 p.m. Conference on "Dissemination of Scientific Information to the Public."

**July 11 and 12.** Society of Chemical Industry. Annual meeting, etc. (See THE CHEMICAL AGE, June 8, p. 642.)

**July 16.** British Standards Institution. Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, 3.30 p.m. Annual general meeting.

**July 20.** British Association for the Advancement of Science. British Medical Association, Tavistock Square, London, W.C.1, 10.15 a.m., statutory meeting of council; 10.45 a.m., statutory meeting of general committee; 12.45 for 1 p.m. (at Claridge's Hotel, Brook Street, W.1), luncheon; 3.30 p.m., general meeting—Sir Richard Gregory, Bt., F.R.S.: "Civilisation and the Pursuit of Knowledge."

## Commercial Intelligence.

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

CHEMICALS & ESSENTIAL OILS LTD., London, W.C. (M., 6/7/46.) May 30, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge, \*. July 14, 1943.

## Company News

**Pyrene Co., Ltd.**, report that, for 1945, profit amounted to £244,323. Three interim dividends, already paid, totalled 24 per cent., the same as for the previous year.

**Goodlass Wall and Lead Industries, Ltd.**, have issued their full report for 1945. It shows net profit of £232,068, as against £222,635, and the recommended dividend of 10 per cent. is 1 per cent. higher.

The report of **Cooper, McDougall & Robertson, Ltd.**, for 1945, shows that a drop from £281,489 to £225,149 in combined trading profits was due principally to provisions made for a reduction in the value of certain

stocks consequent on the end of the war. Profits available for distribution, however, were about £33,000 larger owing mainly to the incidence of taxation. Ordinary dividend is raised from 5 to 8 per cent.

At the annual meeting of **Lever Brothers** and **Unilever N.V.** in Rotterdam, the chairman, Mr. Paul Rykens, stated that war losses had been kept within the limits of the company's capacity to sustain them, and profits had been made enabling them now to propose dividends. Apart from losses suffered as a result of businesses being idle, direct war damage was limited to factories in enemy and enemy-occupied countries. The policy of nationalisation now being pursued in some Central and Eastern European countries, particularly Czechoslovakia, extended also to the company's businesses there, but he was not in a position at the moment to indicate the effect that policy would have on the company's interests.

## New Companies Registered

**Claritas, Ltd.** (413,445).—Private company. Capital, £5000 in 3000 founders' shares of £1, and 4850 ordinary shares of £1. Manufacturers of and dealers in chemical and scientific instruments, etc. Directors: M. J. Drew; H. E. J. Drew; J. C. H. Horsfield; B. G. Wood; F. G. Drew. Registered office: King William Street House, Arthur Street, London, E.C.4.

## Chemical and Allied Stocks and Shares

THE rally in stock markets made further progress, though business in most sections was on moderate lines. An upward trend in British Funds was attributed partly to the expected announcement of the withdrawal of the "tap" issue of Savings Bonds, while industrial shares have been responsive to the export trade news, and generally dividend announcements have created a favourable impression. In the nationalisation groups, iron, coal and steel shares recorded small gains, while home rails responded mildly to the companies' anti-nationalisation moves.

Chemical and kindred shares reflected the prevailing trend of markets. Imperial Chemical moving up to 43s. 3d., while B. Laporte at 100s. held their recent rise, and Borax Consolidated deferred were 49s. 4½d. ex rights to the new shares, which were 7s. 9d. premium. General Refractories, however, eased to 22s. 6d. United Molasses have risen to 56s. 6d., partly on the prospect of the derequisitioning of the company's tankers, while Distillers were good at 132s. 3d. on further consideration of the past

## British Chemical Prices

### Market Reports

year's figures. Higher dividend hopes kept British Glues & Chemicals 4s. ordinary firm at close on 15s., while Erinoid 5s. ordinary moved up to 14s. 9d. British Industrial Plastics 2s. ordinary were 8s. 9d., and De La Rue were £12 $\frac{1}{2}$ , and there has been activity in O. & M. Kleemann 2s. shares, which, following the commencement of dealings, advanced to 33s. 1 $\frac{1}{2}$ d.

Elsewhere, Fisons were dealt in up to 63s., and Cooper McDougall & Robertson up to 42s. British Drug Houses have been less active around 69s. awaiting the new issue decision. Burt Boulton & Haywood marked 27s. 6d. and Cellon 5s. ordinary 29s. 6d. In other directions, Monsanto Chemicals 5 $\frac{1}{2}$  per cent. preference have marked 24s. 6d., and there was activity up to 12s. 7 $\frac{1}{2}$ d. in Greff Chemicals Holdings 5s. ordinary, following the statements at the meeting. British Tar Products 5s. shares have been favoured up to 13s. and British Lead Mills 2s. ordinary up to 12s. 6d. Blythe Colour 4s. ordinary transferred around 48s. 6d., and William Blythe 3s. shares were dealt in at 13s.

Shares of base metal mines rose on the higher metal prices, and, likewise similarly influenced, Amalgamated Metal firmed up to 19s. 10 $\frac{1}{2}$ d. Imperial Smelting were 18s. 6d. In other directions, British Aluminium have been steady at 43s. Satisfaction with the results helped British Plaster Board, which strengthened to 37s. 6d., and Associated Cement at 71s. 3d. regained part of an earlier small decline. Ruston & Hornsby have been firm at 63s. 9d. on the full results. Babcock & Wilcox strengthened to 66s. Among iron and steels, Barrow Haematite rose to 29s. 6d. and Stewarts & Lloyds improved further to 50s., while Dorman Long 24s., Hadfields 24s. 9d., Shipley 30s., and United Steel 22s. 9d. were slightly higher. Thomas & Baldwins also firmed up to 10s. 3d.

Courtaulds continued active around 57s. 6d., with British Celanese 36s. 6d., and textiles generally have been firm on export trade prospects. British Oxygen rose to 101s. 3d. Lever & Unilever moved higher at 56s. 6d. and Lever N.V. were 56s. 9d. on the annual report. Dunlop Rubber continued active around 73s. 3d. Turner & Newall were 92s. 6d. and British Match firm at 50s. Boots Drug were good at 61s. 3d. Beechams deferred moved up to 27s. 3d., Sangors were 34s., and Timothy Whites 46s. Triplex Glass were 45s. 6d., and a rise to 49s. 9d. in Wall Paper Manufacturers was attributed to the purchase tax reduction, which will benefit the company, and also to hopes that paper supplies will improve later in the year. Oil shares failed to hold best prices, but Shell were good on the full results, while Attock and Lobitos showed good gains. On the other hand, Mexican Eagle Oil declined on the official statement that a settlement with the Mexican authorities seems as remote as ever.

A FIRM tone is in evidence throughout the London chemical market and a fair activity is maintained in most sections, although the supply position still remains difficult. Firm prices are ruling in the soda products section, with prussiate and chlorate of soda in good request. A steady demand is reported for Glauber salt and salt-cake and inquiry for lysoposphite of soda is maintained on a moderate scale. Caustic soda and bicarbonate of soda are active. Scarcity of offers is the chief feature of the potash section. A steady demand for acid phosphate of potash is reported, and permanganate of potash is a good market. There is an active inquiry for formaldehyde, and among the heavy acids, oxalic and acetic acid are moving well. Salicylic acid is firm and in steady request. Interest in the coal-tar products market is at the moment chiefly concerned with deliveries against contracts already made, although a good demand is noticeable in the markets for creosote oil and crude tar. Pitch is in brisk demand and the pyridines are quiet. Elsewhere the market displays a steady tone.

**MANCHESTER.**—To some extent pressure for deliveries of chemicals under contracts on the Manchester market during the past week has been affected by the annual industrial holidays at several centres, a factor which has also not been without its influence on fresh inquiry. This seasonal factor apart, however, fairly steady trading conditions have been reported in most sections so far as home business is concerned and additional inquiries on export account have been a feature. The substantial rise in non-ferrous metal prices which came into effect on Monday will, of course, have a sharp reaction on the prices of chemicals other than the rise of £8 10s. per ton in zinc oxide, though at the moment of writing it is not possible to say exactly what the extent of these advances will be.

**GLASGOW.**—A moderate demand for general chemicals for the home trade has been reported during the past week; prices, generally speaking, have remained firm. There has been a good volume of inquiry for export, but a considerable quantity of arrears of orders remains to be overtaken.

### Price Changes

**Lead, White.**—Dry English, in 8-cwt. casks, £83 per ton. Ground in oil, English, in 5-cwt. casks, £94 10s. per ton.

**Pitch.**—MANCHESTER: 75s. to 77s. 6d. per ton, f.o.r.

**Zinc Oxide.**—MANCHESTER (maximum prices per ton for 2-ton lots, d/d): white seal, £54 5s.; green seal, £53 5s.; red seal, £51 15s.

## Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2, at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

### Applications for Patents

- Alloys.—Mathieson Alkali Works. 15410.
- Splitting fats.—Orbis A.G. 15511.
- Preservatives.—Institute of Paper Chemistry. 15658.
- Chlorinated compounds.—Progil. 15848.
- Alkyl and aryl compounds.—Pyridium Corporation. 15392-5.
- Monochromators.—Research Corporation. 15676.
- Aneurin derivative.—Roche Products, Ltd. 15917.
- Leather colouring.—J. H. Sharphouse, and I.C.I., Ltd. 15999.
- Catalytic conversions.—Shell Development Co. 15381.
- Catalytic cracking.—Shell Development Co. 15383.
- Gas measuring.—Sigma Instrument Co., Ltd., F. R. Boosey, and J. Lexham. 15348.
- Gas control valves.—South Metropolitan Gas Co., D. Chandler, and C. J. Templeman. 15810.
- Superphosphates.—Sturtevant Engineering Co., Ltd., H. Richardson & Co. (York), Ltd., J. T. Procter, and A. Ogilvie. 15346.
- Fibrous glass.—A. P. Thurston. (Owens-Corning Fiberglass Corporation.) 15795.
- Plastics.—H. N. Toomey. 15681.
- Thermoplastic material.—G. C. Tyee, and I.C.I., Ltd. 15994.
- Lubricating compositions.—C. C. Wakefield & Co., Ltd. (F. H. Ayden.) 16052.
- Streptomycin.—Wellcome Foundation, Ltd., and T. J. Woodthorpe. 16081.
- Gas producers.—F. J. West, E. West, and West's Improvement Co., Ltd. 15970.
- Distilling plants.—T. O. Wilson. 15964.
- Phenacylpyridines.—American Cyanamid Co. 17067.
- Cathode-ray tubes.—H. P. Barasch. 17236-7.
- Cathode-ray tubes.—F. J. G. van den Bosch. 16927, 17010.
- Elastomers.—British Thomson-Houston Co., Ltd. 17100.
- Polysiloxane compounds.—British Thomson-Houston Co., Ltd. 16954-5.
- Cathode-ray tubes.—E. W. Bull. 17143.
- Resinous material.—Distillers Co., Ltd., and L. Dennis. 17281.
- Polymerisation products.—Distillers Co., Ltd., C. A. Brighton, and J. J. P. Staudinger. 17065.
- Oxygen-containing compounds.—E.I. Du Pont de Nemours & Co. 17069-70.
- Amino nitriles.—E.I. Du Pont de Nemours & Co., W. F. Gresham, and C. E. Schweitzer. 17071.
- Insecticides.—Electrolux, Ltd. 17062.
- Distillation process.—K. W. Gee, and I.C.I., Ltd. 17072.

Water-repellent compositions.—M. Hopley, J. R. F. Jackson, and I.C.I., Ltd. 17190.

Fluid-flow systems.—K.A.C., Ltd., and W. P. Henderson. 17129.

Porous vinyl compounds.—Latex Industries, Ltd., and L. Landau. 16984.

Guanidine derivatives.—Lederle Laboratories, Ltd. 17066.

### Complete Specifications Open to Public Inspection

Production of starch by means of centrifugal separators.—Aktiebolaget Separator. Dec. 5, 1944. (Cognate applications 32609-10 45.) 32608/45.

Igniting a cathode spot in current converters having mercury cathodes and resistance ignition. Dec. 8, 1944. 33367/45.

Liquid atomiser.—Aktieselskabet Niro Atomizer. Aug. 17, 1942. 12334/46.

Cellulose esters.—American Viscose Corporation. Dec. 6, 1944. 24192/45.

Apparatus and process for pressing plastic sheeting.—Bakelite Corporation. Dec. 9, 1944. 31590/45.

Coiled electrodes.—British Thomson-Houston Co., Ltd. Dec. 4, 1944. 32579/45.

Polymers of vinyl compounds and their preparation.—British Thomson-Houston Co., Ltd. Dec. 11, 1944. 33153/45.

Copolymers of vinyl compounds.—British Thomson-Houston Co., Ltd. Dec. 11, 1944. 33154/45.

Water-repellent agents, and the treatment of cellulose materials therewith.—J. R. Geigy A.G. Dec. 5, 1944. 32703/45.

1-Substituted-2, 5-diketo-7-methyl pyrimido-pyrazoles as couplers for colour photography.—General Aniline & Film Corporation. Dec. 5, 1944. 29246/45.

Fluid treating apparatus.—Hilliard Corporation. Dec. 6, 1944. 31662/45.

Instruments for measuring and controlling the modified viscosity of liquids.—A. C. Hoffman. Dec. 9, 1944. 24970/45.

### Complete Specifications Accepted

Polishes.—Koray, Ltd., C. D. Moore, and R. F. Ball. May 27, 1944. 577,515.

Process for the diffusion of metals into iron and steel.—R. L. Samuel, N. A. Lockington, and Metals Interchange Syndicate, Ltd. May 3, 1944. 577,504.

Process for forming plastic solutions and incorporating solid filling material therein.—C. E. Boutwell. April 14, 1944. 577,920.

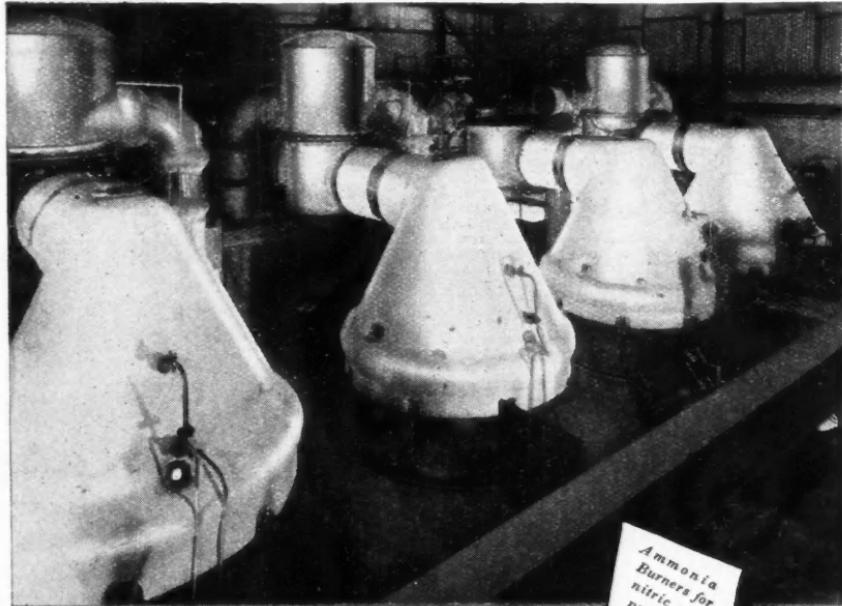
Stabilisation of organic esters of cellulose.—British Celanese, Ltd. July 10, 1943. 577,963.

Containers for liquid fuels.—G. A. Griffiths, and I.C.I., Ltd. (Divided out of 577,951.) Feb. 6, 1942. 577,956.

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Method of stabilising a plastic composition comprising ethyl cellulose.—Hercules Powder Co. April 27, 1942. 577,875.

Manufacture of chlorinated hydrocarbons.—W. N. Howell, and I.C.I., Ltd. March 15, 1943. 577,876.

Bleaching of oils and fats.—Lever Bros. & Unilever, Ltd. Oct. 27, 1943. 577,879.

Production of pure dimethylaniline.—E. B. Maxted. Feb. 20, 1943. 577,901.

Impregnated fibrous material, impregnant, and method of making the same.—E. P. Newton. (Vellumoid Co.) March 21, 1944. 577,918.

Platinum catalysts.—D. H. P. Peel, and I.C.I., Ltd. Jan. 11, 1943. 577,862.

Manufacture of monobrominated dibasic acids and esters thereof.—Roche Products, Ltd., A. W. D'A. Avison, F. Bergel, A. Cohen, and J. W. Haworth. Aug. 21, 1944. 577,877.

Polymerisation of vinyl acetate in emulsion.—Shawinigan Chemicals, Ltd. Oct. 21, 1942. 577,861.

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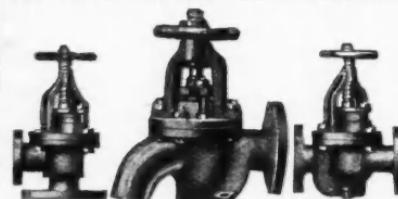
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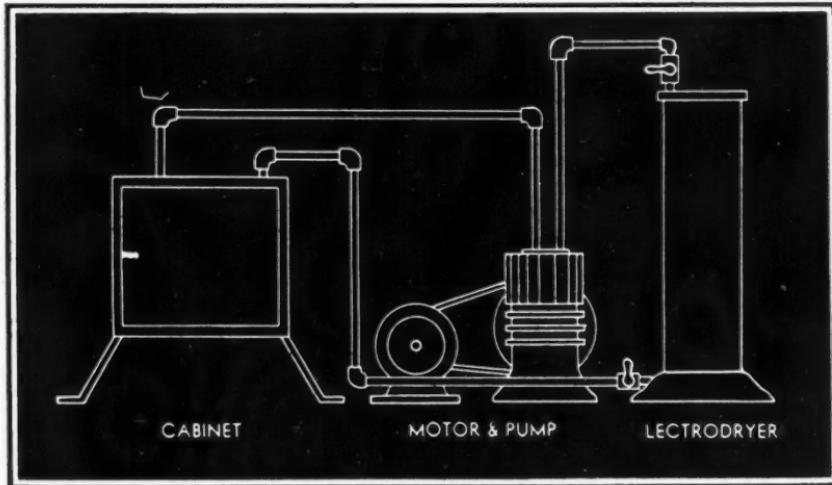
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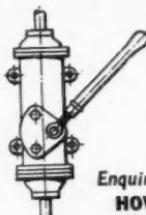


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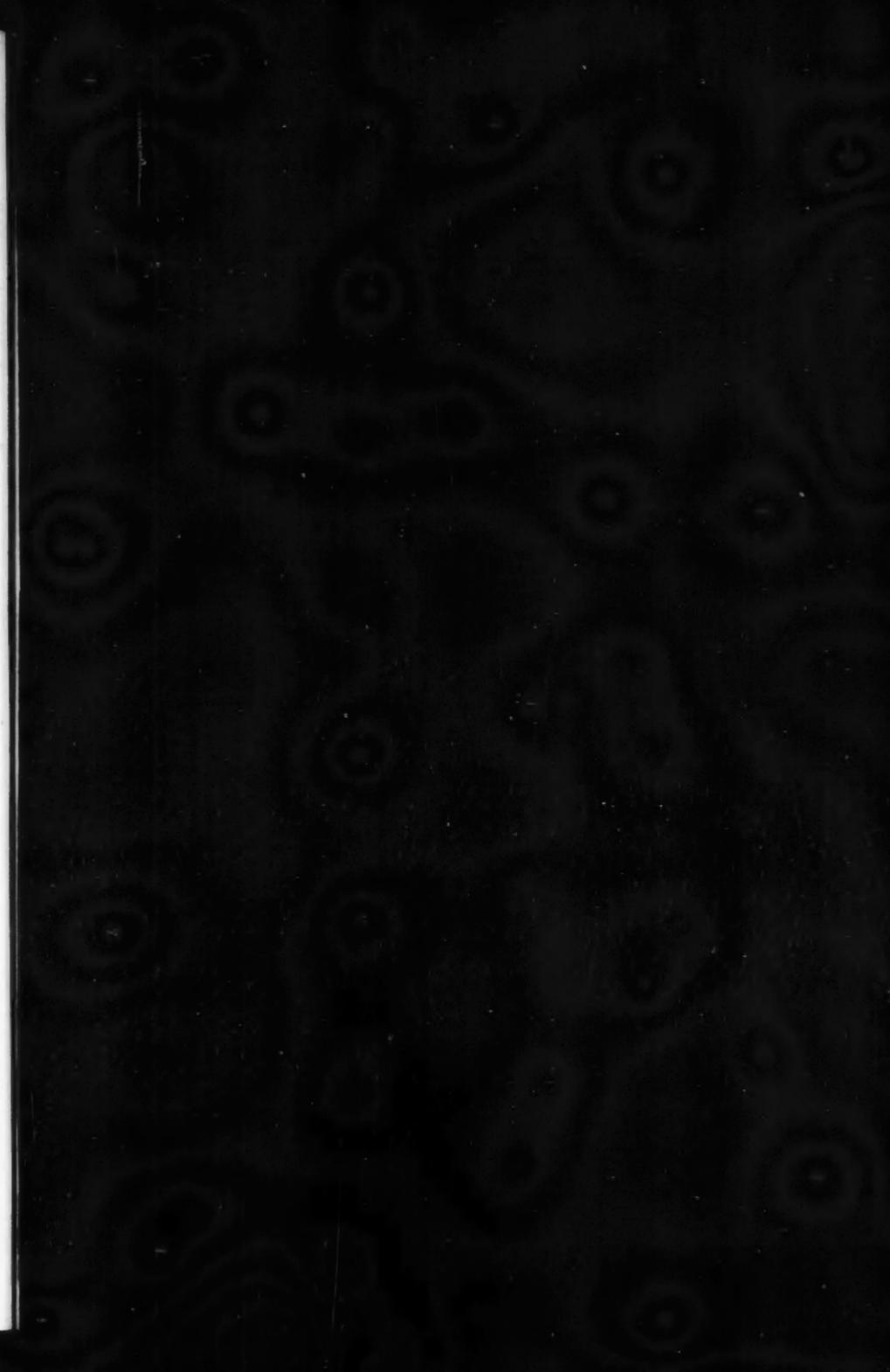
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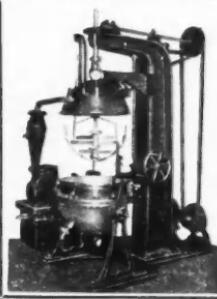
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